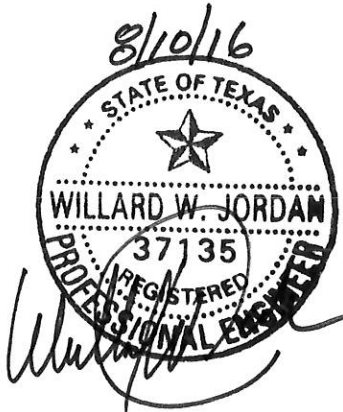


CITY OF LONGVIEW
LAKE-O'-PINES RWPS MV SWITCHGEAR
REPLACEMENT PROJECT

AUGUST 2016



ELECTRICAL EXPERTISE, INC.
REGISTERED ENGINEERING FIRM F2490
ST 87 LAKE CHEROKEE
HENDERSON, TX 75652
903-297-7811

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ADVERTISEMENT FOR BIDS

Sealed proposals addressed to Rolin McPhee, P.E., Director of Public Works, City of Longview, Texas, Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604, will be received until **2:00 p.m., Tuesday, September 13, 2016**, for furnishing all labor, materials, equipment, supplies, and supervision necessary for the construction of **"Lake-O'-Pines RWPS MV Switchgear Replacement Project"**, in accordance with the specifications on file at Electrical Expertise, Inc., ST 87 Lake Cherokee, Henderson, TX 75652. The project consists of replacing existing switchgear at the Lake-O'-Pines Raw Water Pump Station. At the time stated, bids will be opened and publicly read in the Public Works Training Room of the Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604.

Plans and specifications may be examined without charge or obtained for \$50 per set at the office of Electrical Expertise, Inc., (903) 297-7811.

EEO/M/F/V/H/D.

ROLIN McPHEE, P.E.
DIRECTOR OF PUBLIC WORKS
CITY OF LONGVIEW, TEXAS

NOTICE TO BIDDERS OF THE INTENTION OF THE CITY OF LONGVIEW, TEXAS TO LET BIDS FOR THE CONSTRUCTION OF LAKE-O'-PINES RWPS MV SWITCHGEAR REPLACEMENT PROJECT.

SEALED PROPOSALS addressed to Rolin McPhee, P.E., Director of Public Works, City of Longview, Texas, Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604, will be received until **2:00 P.M., Tuesday, September 13, 2016** for furnishing all labor, materials, equipment, supplies, and supervision necessary for the construction of **Lake-O'-Pines RWPS MV Switchgear Replacement Project** in accordance with the plans and specifications on file at **Electrical Expertise, Inc.** The project consists of replacing existing switchgear at the Raw Water Pump Station on Lake-O'-Pines in Marion, Co., TX. At the time stated, bids will be opened and publicly read at the City of Longview, Texas, Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604.

PLANS AND SPECIFICATIONS may be examined without charge or obtained for **\$50** per set at the office of the **Electrical Expertise, Inc., ST 87 Lake Cherokee, Henderson, TX 75652**. No refunds will be made.

ALL BID PROPOSALS submitted should be marked clearly on the outside of the sealed envelope with the project name and bid opening time and date.

A CERTIFIED OR CASHIER'S CHECK, or an acceptable bid bond in an amount not less than five percent (5%) of the base bid shall accompany each bid as a guaranty that, if awarded the contract, the bidder will promptly enter into contract with the City of Longview, Texas and furnish bonds on the forms provided.

THE SUCCESSFUL BIDDER OR BIDDERS will be required to furnish a Performance Bond, Payment Bond, and Maintenance Bond, in the amount of the contract, written by a responsible surety company authorized to do business in the State of Texas, and satisfactory to the Owner as required by Article 5160 V.A.T.C.S.

BIDDERS ARE EXPECTED TO INSPECT the site of the work and to inform themselves of all local conditions. Time of completion shall be **one hundred eighty (180)** calendar days, including Saturdays, Sundays, and legal holidays.

NO BID may be withdrawn after the scheduled closing time for receipt of bids for at least 90 calendar days.

IN CASE of ambiguity or lack of clearness stating the price in the bids, the Owner reserves the right to consider the most advantageous construction thereof or to reject the bid. The Owner reserves the right to reject any or all bids, waive any or all informalities, and to award the contract to the bidder or bidders who, in the opinion of the Owner, offers the proposal to the best interest of same.

EEO/M/F/V/H/D

**ROLIN McPHEE, P. E.
DIRECTOR OF PUBLIC WORKS
CITY OF LONGVIEW, TEXAS**

INFORMATION FOR BIDDERS

1. Receipt and Opening of Proposals. The City of Longview (Owner) invites Proposals to be submitted on the forms provided. Proposals will be received by the Owner at the Public Works Service Center, 933 Mobile Drive, Longview, TX, 75604, until the time and date specified in the Notice to Bidders, and then at the stated time and place publicly opened and read aloud. Only the total amount of the bid will be read aloud, however, the Proposals will be open for public inspection immediately following the opening.

The Owner reserves the right to waive any informality and to reject any or all bids. Any Proposal received after the specified time will be returned to the Bidder unopened. No Proposal may be withdrawn within 90 days from the opening date. Conditional bids will not be considered.

2. Preparation of Proposals. Each Proposal must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and the name of the project for which the Proposal is submitted. If forwarded by mail, the sealed envelope containing the Proposal must be enclosed in another envelope addressed as specified.
3. Withdrawal or Modification of Bid. Prior to the bid opening, no Proposal may be withdrawn after 48 hours before the time of the bid opening. Any modification of any bid may be made under the same conditions as set forth for submitting a Proposal.
4. Qualifications of Bidders. The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Proposal if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that the bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.
5. Bid Security. Each Proposal must be accompanied by cash, certified check of the Bidder, or a bid bond duly executed by the Bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the base bid. Such cash, checks or bid bonds will be returned to all except the three lowest Bidders within three days after the opening of bids, and the remaining cash, checks, or bid bonds will be returned promptly after the Owner and the accepted Bidder have executed the contract, or if no award has been made within 90 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his Proposal.

6. Liquidated Damages for Failure to Enter into Contract. The successful Bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within 15 days after he has received notice of the acceptance of his Proposal, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his Proposal.
7. Time of Completion and Liquidated Damages. Bidder must agree to commence work within 10 days after the date to be specified in a written "Notice to Proceed" by the Owner and to fully complete the project within the time stated in the Proposal. The bidder must agree to pay, as liquidated damages, the sum of **\$300.00** for each consecutive calendar day thereafter as hereinafter provided for in the General Conditions.
8. Conditions of Work. Each Bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder of his obligation to furnish all material and labor necessary to carry out the provision of his Contract. Insofar as possible, the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.
9. Addenda and Interpretation. No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any Bidder orally. Every request for such interpretation should be in writing addressed to Electrical Expertise, Inc., ST 87 Lake Cherokee Henderson, TX, 75652, and to be given consideration must be received at least five days prior to the date fixed for the opening of Proposals. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by regular mail to all prospective bidders not later than two days prior to the date fixed for the opening of Proposals. Failure of any Bidder to receive any such addendum or interpretation shall not relieve such Bidder from any obligation under his bid as submitted. Each Bidder shall check with Electrical Expertise Engineering, Inc., at an appropriate time to determine that he or she has received all Addenda; failure to do so shall be the complete responsibility of the Bidder. All addenda so issued shall become part of the contract documents.
10. Security for Faithful Performance. Simultaneously with his delivery of the executed Contract, the Contractor shall furnish bonds as security for faithful performance of this Contract and for the payment of all persons performing labor on the project under Contract and furnishing materials in connection with Contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner. In the case that the total bid is \$25,000, or less, the Contractor may elect not to furnish a Performance and Payment Bond; provided that it is understood and agreed that no progress or monthly payment will be made and that final payment will be made following completion and acceptance by the City of the entire project.

11. Power of Attorney. Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.
12. Laws and Regulations. The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout and they will be deemed to be included in the Contract the same as though herein written out in full.
13. Obligation of Bidder. At the time of the opening of Proposals each Bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents, including all addenda. The failure or omission of any Bidder to examine any form, instrument or document shall in no way relieve any Bidder from any obligation in respect of his bid.
14. Certification of Completion. A Certificate of Completion, which is included in these contract documents, will be required in the final completion and acceptance of the project as provided in the General Conditions of Agreement Item 5.06.

STATEMENT OF QUALIFICATIONS

CONTRACTOR: _____

ADDRESS: _____

1. Name of Project: _____

Owner: _____

Address: _____

Phone: _____

Value of Contract: _____

Date Started: _____

Date Completed: _____

Approximate Quantities of Major Items: _____

2. Name of Project: _____

Owner: _____

Address: _____

Phone: _____

Value of Contract: _____

Date Started: _____

Date Completed: _____

Approximate Quantities of Major Items: _____

3. Name of Project: _____

Owner: _____

Address: _____

Phone: _____

Value of Contract: _____

Date Started: _____

Date Completed: _____

Approximate Quantities of Major Items: _____

4. Other Project References: _____

**CITY OF LONGVIEW
PUBLIC WORKS DEPARTMENT**

CERTIFICATE OF FINAL COMPLETION OF:

**LAKE-O'-PINES RWPS MV
SWITCHGEAR REPLACEMENT PROJECT**

CONTRACT DATED: _____

STATE OF TEXAS

COUNTY OF GREGG }

Before me, the undersigned authority, a Notary Public in and for Gregg County, Texas, on this day personally appeared _____ who, being by me duly sworn on his oath, says that he is/represents _____, the contractor who has performed a contract with the City of Longview for the construction of the work described above, and is duly authorized to make this affidavit; that he has personally examined the work described above as required by the specifications of the City of Longview attached to the contract; that said work and all items thereof have been completed and all known defects made good; that thereof have been completed and all known defects made good; that all surplus material, refuse, dirt and rubbish have been cleaned up, removed and disposed of; that all parts of the work are in a neat, tidy, finished condition and ready in all respects for acceptance by the City; that all the required work has been performed in accordance with the specifications, that rates of pay for all labor employed on said work have not been below the minimum set out in Labor Classification and Minimum Wage Scale in said Specifications and that within the knowledge of affiant all just bills for labor and material and for the rental or use of any equipment or apparatus used in, on, or in connection with the work have been paid in full by the Contractor.

Sworn to and subscribed before me this _____ day of _____, 20____.

Notary Public, Gregg County, Texas

This is to certify that I have thoroughly inspected the work performed by the above named contractor on the above described contract and find all things in accordance with the plans and specifications governing this work.

Inspector

Project Consulting Engineer

WAGE RATES

General Decision Number: TX160200 01/08/2016 TX200

Superseded General Decision Number: TX20150200

State: Texas

Construction Type: Building

County: Marion County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016

ASBE0021-002 05/01/2013

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 21.52	7.15

BOIL0587-003 01/01/2013

	Rates	Fringes
Boilermaker.....	\$ 22.71	20.63

*IRON0084-010 06/01/2015

	Rates	Fringes
IRONWORKER, REINFORCING.....	\$ 23.02	6.35

LABO0154-022 05/01/2008

	Rates	Fringes
Laborers: (Mason Tender - Cement/Concrete).....	\$ 14.25	2.90

SUTX2009-055 04/20/2009

	Rates	Fringes
BRICKLAYER.....	\$ 20.00	0.00
CARPENTER, Includes Acoustical Ceiling Installation, and Hardwood Floor Installation.....	\$ 14.30	0.00
CEMENT MASON/CONCRETE FINISHER...	\$ 13.29	0.00
ELECTRICIAN.....	\$ 18.06	4.87
IRONWORKER, STRUCTURAL.....	\$ 15.48	0.00
LABORER: Common or General.....	\$ 9.73	0.00
LABORER: Landscape & Irrigation.....	\$ 8.50	0.22
LABORER: Mason Tender - Brick...	\$ 12.02	0.00
LABORER: Mortar Mixer.....	\$ 12.00	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 11.00	0.00
OPERATOR: Bulldozer.....	\$ 13.00	0.31
OPERATOR: Crane.....	\$ 21.33	0.00
OPERATOR: Forklift.....	\$ 14.58	0.00
OPERATOR: Loader (Front End)....	\$ 10.54	0.00
PAINTER: Brush, Roller and Spray.....	\$ 13.50	0.00
PLUMBER.....	\$ 20.38	4.74
ROOFER.....	\$ 13.64	1.80
SHEET METAL WORKER.....	\$ 17.00	0.00
TILE SETTER.....	\$ 15.00	0.00
TRUCK DRIVER.....	\$ 12.52	0.00

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

General Decision Number: TX160300 05/06/2016 TX300

Superseded General Decision Number: TX20150300

State: Texas

Construction Type: Building

County: Gregg County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016
1	01/15/2016
2	02/05/2016
3	03/18/2016
4	05/06/2016

BOIL0074-003 01/01/2014

	Rates	Fringes
BOILERMAKER.....	\$ 23.14	21.55

ELEC1151-003 09/01/2015		

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring and Installatin of Sound and Communication Systems).....	\$ 23.40	13%+5.20

ELEV0021-006 01/01/2016		

	Rates	Fringes
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ELEVATOR MECHANIC.....\$ 38.01 29.985+a

FOOTNOTES: a - A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.

New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Veterans Day.

ENGI0178-005 06/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
(1) Tower Crane.....	\$ 29.00	10.60
(2) Cranes with Pile Driving or Caisson Attachment and Hydraulic Crane 60 tons and above.....	\$ 28.75	10.60
(3) Hydraulic cranes 59 Tons and under.....	\$ 27.50	10.60

IRON0084-011 06/01/2015

	Rates	Fringes
IRONWORKER, ORNAMENTAL.....	\$ 23.02	6.35

* PLUM0100-006 05/01/2016

	Rates	Fringes
PIPEFITTER.....	\$ 30.14	10.41

SUTX2014-026 07/21/2014

	Rates	Fringes
BRICKLAYER.....	\$ 18.33	2.50
CARPENTER (Form Work Only).....	\$ 13.63	0.00
CARPENTER, Excludes Form Work....	\$ 25.00	0.00
CEMENT MASON/CONCRETE FINISHER...	\$ 13.94	0.00
ELECTRICIAN (Communication Technician Only).....	\$ 14.00	2.90
ELECTRICIAN (Low Voltage Wiring Only).....	\$ 14.36	2.44

INSULATOR - MECHANICAL (Duct, Pipe & Mechanical System Insulation).....	\$ 19.77	7.13
IRONWORKER, REINFORCING.....	\$ 12.27	0.00
IRONWORKER, STRUCTURAL.....	\$ 20.00	0.00
LABORER: Common or General.....	\$ 11.02	0.00
LABORER: Mason Tender - Brick...	\$ 11.36	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 10.66	0.00
LABORER: Pipelayer.....	\$ 12.49	2.13
LABORER: Roof Tearoff.....	\$ 11.28	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 15.60	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 13.93	0.00
OPERATOR: Bulldozer.....	\$ 14.00	0.27
OPERATOR: Drill.....	\$ 16.22	0.34
OPERATOR: Forklift.....	\$ 14.83	0.00
OPERATOR: Grader/Blade.....	\$ 15.10	1.94
OPERATOR: Loader.....	\$ 12.62	2.42
OPERATOR: Mechanic.....	\$ 17.52	3.33
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 16.03	0.00
OPERATOR: Roller.....	\$ 12.70	0.00
PAINTER (Brush, Roller, and Spray).....	\$ 14.45	0.00
PLUMBER.....	\$ 21.35	4.55
ROOFER.....	\$ 13.75	0.00
SHEET METAL WORKER (HVAC Duct Installation Only).....	\$ 22.73	7.52

SHEET METAL WORKER, Excludes		
HVAC Duct Installation.....	\$ 15.44	1.46
TILE FINISHER.....	\$ 11.22	0.00
TILE SETTER.....	\$ 14.74	0.00
TRUCK DRIVER: Dump Truck.....	\$ 12.39	1.18
TRUCK DRIVER: Flatbed Truck.....	\$ 19.65	8.57
TRUCK DRIVER: Semi-Trailer		
Truck.....	\$ 12.50	0.00
TRUCK DRIVER: Water Truck.....	\$ 12.00	4.11

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

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200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION

Liquidated Damages Calculation

PROJECT Lake-O'-Pines RWPS MV SWGR C/O Project

C.I.P. PROJECT NO. _____

CONTRACT NO. _____

PREPARED BY Electrical Expertise, Inc.

PROJECT MANAGER _____

Rolin McPhee, PE

PROJECT SPONSOR _____

City of Longview, TX

DATE _____

Aug. 7, 2016

ON-SITE PROJECT INSPECTION (CITY FORCES)

Engineer/Architect	<u>0</u>	hr/wk @	<u>\$43.65</u>	/hr =	<u>\$0.00</u>	/wk (+7) =	<u>\$0.00</u>	/day
Supervising Inspector	<u>10</u>	hr/wk @	<u>\$22.24</u>	/hr =	<u>\$222.40</u>	/wk (+7) =	<u>\$31.77</u>	/day
Inspector	<u>0</u>	hr/wk @	<u>\$0.00</u>	/hr =	<u>\$0.00</u>	/wk (+7) =	<u>\$0.00</u>	/day

Sub-Total = \$31.77 /day

Overhead: .00 % of Sub-Total = \$31.77 /day

Overtime (over 40 Hours):

Supervising Inspector	<u>0</u>	hr/wk @	<u>\$0.00</u>	/hr =	<u>\$0.00</u>	/wk (+7) =	<u>\$0.00</u>	/day
Inspector	<u>0</u>	hr/wk @	<u>\$0.00</u>	/hr =	<u>\$0.00</u>	/wk (+7) =	<u>\$0.00</u>	/day

Sub-Total = \$0.00 /day

Overhead: .00 % of Sub-Total = \$0.00 /day

Consulting Services:

Engineer/Architect (Private Sector)	<u>8</u>	hr/wk @	<u>\$150.00</u>	/hr =	<u>#####</u>	/wk (+7) =	<u>\$171.43</u>	/day
Technician (Private Sector)	<u>0</u>	hr/wk @	<u>\$0.00</u>	/hr =	<u>\$0.00</u>	/wk (+7) =	<u>\$0.00</u>	/day

Project Management

Project Manager (City)	<u>10</u>	hr/wk @	<u>\$43.65</u>	/hr =	<u>\$436.50</u>	/wk (+7) =	<u>\$62.36</u>	/day
Technician (City)	<u>0</u>	hr/wk @	<u>\$24.33</u>	/hr =	<u>\$0.00</u>	/wk (+7) =	<u>\$0.00</u>	/day

Sub-Total = \$62.36 /day

Overhead: .00 % of Sub-Total = \$62.36 /day

INTEREST ON MONEY PAID TO THE CONTRACTOR, BUT NOT USABLE

Assuming 80% paid @ completion date:

Construction Cost	<u>\$396,296.00</u>
Total Paid (80%)	<u>\$317,036.80</u>
Daily Interest @ 0.0110 % of Total Paid: (or <u>4</u> % annual interest rate):	= <u>\$34.87</u> /day
Loss of Revenue for Revenue Producing Projects	= <u>\$0.00</u> /day
Loss of Capital Recovery Fees	= <u>\$0.00</u> /day

Actual Expenses Incurred	= <u>\$0.00</u> /day
Equipment Rental	= <u>\$0.00</u> /day
Space Rental	= <u>\$0.00</u> /day

Total per Calendar Day \$300.43

USE \$300.00

VENDOR COMPLIANCE TO STATE LAW

The 1985 Session of the Texas Legislature passed House Bill 620 relative to the award of contracts to non-resident bidders. This law provides that, in order to be awarded a contract as low bidder, non-resident bidders (out-of-state contractors whose corporate offices or principal place of business are outside of the state of Texas) bid projects for construction, improvements, supplies or services in Texas at an amount lower than the lowest Texas resident bidder by the same amount that a Texas resident bidder would be required to under bid a non-resident bidder in order to obtain a comparable contract in the state in which the non-resident's principal place of business is located. The appropriate blanks in Section A must be filled out by all out-of-state or non-resident bidders in order for your bid to meet specifications. The failure of out-of-state or non-resident contractors to do so will automatically disqualify that bidder. Resident bidders must check the blank in Section B.

- A. Non-resident vendors in _____ (insert state), our principal place of business, are required to be _____ percent lower than resident bidders by state law. A copy of the statute is attached.

Non-resident vendors in _____ (insert state), our principal place of business, are not required to underbid resident bidders.

- B. _____ Our principal place of business or corporate offices are in the State of Texas.

BIDDER:

(company)

(address)

(city, state, zip)

By: _____
(signature)

(print name)

(title)

THIS FORM MUST BE INCLUDED WITH YOUR SEALED BID

FORM 1295 EXPLANATION

Certificate of Interested Parties (Form 1295)

In 2015, the Texas Legislature adopted House Bill 1295, which added Section 2252.908 of the Government Code. The law states that a governmental entity may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties to the governmental entity. The disclosure of interested parties will be submitted online via Form 1295 and must be submitted to the governmental entity prior to any signed contract and/or vote by the governing authority.

The Filing Process:

1. Prior to award by City Council, your firm will be required to log in to the Texas Ethics Commission, https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm and fill out the Electronic Filing Application.
2. Once submitted, the system will generate an electronic Form 1295 displaying a "Certificate Number." Your firm must print, sign and notarize Form 1295.
3. **Within seven (7) business days** from notification of pending award by the City of Longview Purchasing Department, the completed Form 1295 **must** be submitted to City of Longview.
4. Your firm will need to repeat this process and obtain a separate Form 1295 each time you enter into a new contract, renew a contract, or make modification and/or amendments to a City of Longview contract.

Instructions and information are available at <https://www.ethics.state.tx.us/tec/1295-Info.htm> or you may call the Texas Ethics Commission at (512) 463-5800.

BY SUBMITTING A BID YOUR FIRM AGREES TO ADHERE TO HB 1295 REFERENCED ABOVE.

Please Note: No action required until notification of potential award by the City of Longview Purchasing Department.

CERTIFICATE OF INTERESTED PARTIES**FORM 1295**

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the goods or services to be provided under the contract.

4	Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
			Controlling	Intermediary

5 Check only if there is NO Interested Party. ☐

6 AFFIDAVIT

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day
of _____, 20 _____, to certify which, witness my hand and seal of office.

Signature of officer administering oath

Printed name of officer administering oath

Title of officer administering oath

ADD ADDITIONAL PAGES AS NECESSARY

SEPARATION OF MATERIALS FORM

STATE SALES TAX. The Contractor's attention is directed to paragraph No. 3 of Ruling No. 9 by obtaining the necessary permit or permits from the State Comptroller allowing the purchase of materials for incorporation in this project without having to pay the Limited Sales, Excise and Use Tax at the time of purchase. Such bidders must submit segregated prices for the total cost of materials and total cost of services, and the successful bidder must require his sub-contractors to obtain such permits and to sign written sub-contracts in which the prices are segregated for the total cost of materials and the total cost of services. Total materials cost should not include materials which are used or consumed in performing the work, but do not become a part of the completed installation.

After the bid opening and prior to execution of contract, the low bidder will be required to provide a separation of materials costs and labor costs for the amounts of the base bid and any alternatives. The following form shall be used to provide this information. This form shall be submitted with the executed contract and such statement will become a part of the contract:

STATEMENT OF MATERIALS AND SERVICES

City of Longview

Project Name: Lake-O'-Pines RWPS MV Switchgear Replacement Project

Total Materials Cost: \$ _____

Total Service Cost: \$ _____

TOTAL CONTRACT PRICE: \$ _____

Note: The total materials cost plus the total services cost must equal the amount shown of the total contract price.

PROPOSAL

CITY OF LONGVIEW
PUBLIC WORKS SERVICE CENTER
933 MOBILE DRIVE
LONGVIEW, TX 75604
Lake-O'-Pines RWPS MV Switchgear Replacement Project
BIDS 2:00 P.M., Tuesday, September 13, 2016

Proposal of _____, (hereinafter called "Bidder"), a corporation, organized and existing under the laws of the State of _____ a partnership, or an individual doing business as _____ (strike out inapplicable terms).

TO THE CITY OF LONGVIEW, TEXAS (OWNER):

The undersigned bidder, in response to the Notice to Bidders for the construction of the above project and in conformance with the Information for Bidders; having examined the plans, specifications, related documents and the site of the proposed work; being familiar with all of the conditions relating to the construction of the proposed project, including the availability of materials and labor; hereby proposes to furnish all labor, materials, supplies, equipment, and superintendence necessary for the construction of the project in accordance with the plans, specifications, and contract documents at the unit prices proposed herein.

The undersigned Bidder proposes, acknowledges, and agrees to construct the entire project as shown on the plans, fully in accordance with the requirements of the plans, specifications, and contract documents for the prices included in this Proposal and fully understands and agrees that the various items of material, labor, and construction not specifically enumerated and provided for herein are considered subsidiary to the several items for which this direct payment is specifically provided. Furthermore, the undersigned agrees that one such subsidiary item is the protection, maintenance, repair, or replacement of all underground lines and services, whether shown on the plans or not, all to the full satisfaction of the Engineer and in a timely manner.

CITY OF LONGVIEW, TEXAS
 "LAKE-O'-PINES RWPS MV SWITCHGEAR REPLACEMENT PROJECT"
 BID PROPOSAL

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL PRICE
		1	LS	XXXXXXXX	\$ _____

NOTE---ONLY ONE (1) OF THE FOLLOWING BID ITEMS WILL BE CONSIDERED FOR POSSIBLE AWARD:

BID ITEM #1:

A. Furnish and install the following:

1. Remove and replace the three (3) existing Medium Voltage underground service lateral wiring runs between the pad mounted transformer and the Medium Voltage fused switches.
2. Remove and replace the existing Medium Voltage Variable Frequency Drive for Raw Water Pump #1.
3. Remove and replace the existing Medium Voltage feeder wiring run between the Medium Voltage Fused Switch #1 and the Medium Voltage Variable Frequency Drive #1.
4. Remove and replace the existing Medium Voltage motor feeder wiring run between the Medium Voltage Variable Frequency Drive #1 and Raw Water Pump #1 Motor.

5. Re-connect all existing power, branch circuit, control, and SCADA system wiring for the Variable Frequency Drive #1.

B.	Miscellaneous Allowance	1	LS	XXXXXXXXXX	<u>\$20,000.00</u>
----	-------------------------	---	----	------------	--------------------

TOTAL BID ITEM #1 (A. + B.)

1	LS	XXXXXXXXXX	\$ _____
---	----	------------	----------

BID ITEM #2:

A. Furnish and install the following:

1. Remove and replace the three (3) existing Medium Voltage underground service lateral wiring runs between the pad mounted transformer and the Medium Voltage fused switches.

2. Remove and replace the existing Medium Voltage Variable Frequency Drives for Raw Water Pump #1 & Raw Water Pump #2.

3. Remove and replace the two (2) existing Medium Voltage feeder wiring runs between the Medium Voltage Fused Switches and the Medium Voltage Variable Frequency Drives.

1	LS	XXXXXXXXXX	\$ _____
---	----	------------	----------

4. Remove and replace the two (2) existing Medium Voltage motor feeder wiring runs between the Medium Voltage Variable Frequency Drives and the Raw Water Pump #1 & #2 Motors.

5. Re-connect all existing power, branch circuit, control, and SCADA system wiring for the two (2) Variable Frequency Drives for RWP #1 & RWP#2.

B. Miscellaneous Allowance	1	LS	XXXXXXXXXX	<u>\$20,000.00</u>
----------------------------	---	----	------------	--------------------

TOTAL BID ITEM #2 (A. + B.)

1	LS	XXXXXXXXXX	\$ _____
---	----	------------	----------

BID ITEM #3:

A. Furnish and install the following:

1. Remove and replace the three (3) existing Medium Voltage underground service lateral wiring runs between the pad mounted transformer and the Medium Voltage fused switches.

2. Remove the existing Medium Voltage Variable Frequency Drive for Raw Water Pump #2.

1	LS	XXXXXXXXXX	\$ _____
---	----	------------	----------

BID ITEM #4:

1 LS XXXXXXXX \$ _____

A. Furnish and install the following:

1. Remove and replace the three (3) existing Medium Voltage underground service lateral wiring runs between the pad mounted transformer and the Medium Voltage fused switches.
2. Remove and replace the existing Medium Voltage Variable Frequency Drive for Raw Water Pump #1.
3. Remove and replace the existing Medium Voltage feeder wiring run between the Medium Voltage Fused Switch #1 and the Medium Voltage Variable Frequency Drive #1.
4. Remove and replace the existing Medium Voltage motor feeder wiring run between the Medium Voltage Variable Frequency Drive #1 and Raw Water Pump #1 Motor.
5. Re-connect all existing power, branch circuit, control, and SCADA system wiring for the Variable Frequency Drive #1.
6. Remove the existing Medium Voltage Variable Frequency Drive for Raw Water Pump #2.

7.	Remove the existing Medium Voltage feeder wiring run between the Medium Voltage Fused Switch #2 and the Medium Voltage Variable Frequency Drive #2.				
8.	Furnish and install a Medium Voltage Reduced Voltage Solid State Starter (RVSS) for RWP#2.				
9.	Furnish and install Medium Voltage feeder wiring run between the Medium Voltage Fused Switch #2 and the RVSS.				
10.	Remove the existing Medium Voltage motor feeder wiring run between the Medium Voltage Variable Frequency Drive and the Raw Water Pump #2 Motor.				
11.	Furnish and install proposed Medium Voltage motor feeder wiring run between the RVSS and the Raw Water Pump #2 Motor.				
12.	Re-connect all existing power, branch circuit, control, and SCADA system wiring for the RVSS for RWP#2.				
B.	Miscellaneous Allowance	1	LS	XXXXXXXXXX	<u>\$20,000.00</u>
<hr/>					
TOTAL BID ITEM #4 (A. + B.)		1	LS	XXXXXXXXXX	\$ _____

PROPOSAL: Lake-O'-Pines RWPS MV Switchgear Replacement Project

The undersigned Bidder hereby agrees to begin work under the contract on or before the date to be specified in the written Notice to Proceed and to fully complete the project within **180** consecutive calendar days. The undersigned Bidder further agrees to pay, as liquidated damages, the sum of **\$300.00** for each consecutive calendar day thereafter as provided in Item 7 of the Information for Bidders.

The undersigned Bidder has contacted, within 72 hours prior to this bid opening, the office of the _____ and has determined that all Addenda are as follows:

Addendum No. 1, dated _____; _____

Addendum No. 2, dated _____; _____

The undersigned Bidder acknowledges and agrees that this Proposal shall be good and may not be withdrawn for a period of 90 calendar days from the date of this bid opening.

The undersigned Bidder is obligated to and shall show accurate unit prices as well as total amounts, and agrees that in the case of ambiguity between unit prices and total amounts or in the case of any other ambiguity the Owner may interpret an ambiguity in a manner most advantageous to the Owner or reject the bid.

The undersigned Bidder further acknowledges and agrees that a bid that has been opened may not be changed for the purpose of correcting an error in the final bid price.

The undersigned Bidder agrees to execute the Contract Agreement and furnish the required Performance Bond, Payment Bond, and Maintenance Bond within 15 calendar days from the date of acceptance of the Proposal.

PROPOSAL: Lake-O'-Pines RWPS MV Switchgear Replacement Project

The undersigned Bidder has attached and made a part of this Proposal a bid security in conformance with Item 5 of the Information for Bidders.

Submitted by:

(Signature)

(Firm)

(Name - Typed or Printed)

(Address)

(Title)

(City, County, State, Zip Code)

(Attest - Date)

(Area Code-Telephone Number)

(Corporation Seal)

(Fax Number)

BID BOND
(INSERT FORMS HERE)

STANDARD FORM OF AGREEMENT

Approved as to Legal Form by
City of Longview Legal Counsel

STATE OF TEXAS }
COUNTY OF GREGG }

THIS AGREEMENT, made and entered into this ____ day of _____, A.D. 20__, by and between the City of Longview of the County of Gregg and State of Texas, acting through its City Manager, thereunto duly authorized so to do, Party of the First Part, hereinafter termed OWNER, and _____ of the City of _____, County of _____ and State of _____, Party of the Second Part, hereinafter termed CONTRACTOR.

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the Party of the First Part (OWNER), and under the conditions expressed in the bond bearing even date herewith, the said Party of the Second Part (CONTRACTOR), hereby agrees with the said Party of the First Part (OWNER) to commence and complete the construction of certain improvements described as follows:

Lake-O'-Pines RWPS MV Switchgear Replacement Project

and all extra work in connection therewith, under the terms as stated in this Standard Form of Agreement; all of the documents attached to this Standard Form of Agreement; all Plans, Specifications and drawings for the Sabine HSPS & Cherokee RWPS MV Switchgear Replacement Project as prepared by the OWNER's engineer (herein entitled "ENGINEER"); and all printed or written explanatory materials of said Plans, Specifications and drawings. The CONTRACTOR hereby agrees with the OWNER that the CONTRACTOR shall commence and complete all such construction and work at the CONTRACTOR's own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said construction and work.

The documents that are attached to and for all purposes made part of this Standard Form of Agreement include the Advertisement for Bids, Notice to Bidders, Information for Bidders, Statement of Qualifications, Certificate of Final Completion, Wage Rates, Liquidated Damages Calculation, Vendor Compliance to State Law, Separation of Materials Form, CONTRACTOR's Proposal, Bid Bond, Construction Performance Bond, Construction Payment Bond, Maintenance Bond, Certificate of Insurance, , General Conditions of Agreement, Special Conditions of Agreement, and Technical Specifications. This agreement shall also include all Plans, Specifications and drawings for the Lake-O'-Pines RWPS MV Switchgear Replacement Project prepared by the ENGINEER, and all printed or written explanatory materials of said Plans, Specifications and drawings. This Standard Form of Agreement and the documents listed herein shall collectively evidence and constitute the entire contract between the parties hereto regarding the subject matter hereof.

The CONTRACTOR hereby agrees to commence work within ten (10) days after the date written notice to do so shall have been given to him, and to complete the same within one hundred eighty (180) calendar days after the date of the written notice to commence work, subject to such extensions of time as are provided by the General and Special Conditions of Agreement.

CONTRACTOR's failure to timely commence work or diligently pursue completion of the work within the time limitations set out herein shall constitute a material breach of this contract. TIME IS OF THE ESSENCE IN THE PERFORMANCE OF THIS CONTRACT.

The OWNER agrees to pay the CONTRACTOR in current funds the price or prices shown in the Proposal,

which forms a part of this contract, such payments to be subject to the terms and conditions of this contract, including without limitation the General and Special Conditions of Agreement.

Without regard to and notwithstanding any rules on conflicts of law, this contract shall be subject to and interpreted in conformance with the laws of the State of Texas, unless expressly required otherwise by federal law or regulations. Venue for any action arising hereunder shall lay exclusively in Gregg County, Texas, for actions in state court and in the Eastern District of Texas, Tyler Division, for actions in federal court.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in the year and day first above written.

City of Longview, Texas
Party of the First Part (OWNER)

Party of the Second Part (CONTRACTOR)

By: _____

By: _____

ATTEST:

ATTEST:

(Seal)

(Seal)

PERFORMANCE BOND

STATE OF TEXAS §
COUNTY OF GREGG §

KNOW ALL MEN BY THESE PRESENTS: That _____ of the City of _____ County of _____, and State of _____, as principal, and _____ authorized under the laws of the State of Texas to act as surety on bonds for principals, are held and firmly bound unto the City of Longview, Texas (Owner), in the penal sum of: _____ Dollars (_____) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written contract with the Owner, dated the ____ day of _____, 20____, to complete

“Lake-O’-Pines RWPS MV Switchgear Replacement Project”

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform said Contract and shall in all respects duly and faithfully observe and perform all and singular the covenants, conditions and agreements in and by said contract agreed and covenanted by the Principal to be observed and performed, and according to the true intent and meaning of said Contract and the Plans and Specifications hereto annexed, then this obligation shall be void; otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code, as amended, and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract, or to the work performed thereunder, or the plans, specifications, or drawings accompanying the same, shall in anywise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work to be performed thereunder.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20__.

Principal

Surety

By _____

By _____

Title _____

Title _____

Address: _____

Address: _____

The name and address of the Resident Agent of Surety is: _____

PAYMENT BOND

STATE OF TEXAS §
COUNTY OF GREGG §

KNOW ALL MEN BY THESE PRESENTS: That _____ of the City of _____ County of _____, and State of _____, as principal, and _____ authorized under the laws of the State of Texas to act as surety on bonds for principals, are held and firmly bound unto the City of Longview, Texas (Owner), in the penal sum of _____ Dollars (_____) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written contract with the Owner, dated the ____ day of _____, 20____, to construct

“Lake-O’-Pines RWPS MV Switchgear Replacement Project”

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the work provided for in said contract, then, this obligation shall be void; otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code, as amended, and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract, or to the work performed thereunder, or the plans, specifications, or drawings accompanying the same, shall in anywise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work to be performed thereunder.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this

instrument this _____ day of _____, 20____.

Principal

Surety

By _____

By _____

Title _____

Title _____

Address _____

Address _____

The name and address of the Resident Agent of Surety is: _____

ONE-YEAR MAINTENANCE BOND

STATE OF TEXAS §
COUNTY OF GREGG §

KNOW ALL MEN BY THESE PRESENTS:

That we, _____ as Principal, hereinafter called "Contractor", and the other subscriber hereto as Surety, do hereby acknowledge ourselves to be held and firmly bound to the City of Longview, a municipal corporation, in the sum of _____ Dollars (_____) for the payment of which sum well and truly to be made to the City of Longview, and its successors, the said Contractor and Surety do bind themselves, their successors and assigns jointly and severally. The conditions of this obligation are such that:

WHEREAS, the said Contractor has entered into a contract in writing with the City of Longview, Texas, dated of even date herewith, for completion of

"Lake-O'-Pines RWPS MV Switchgear Replacement Project"

all of such work to be done as set out in full in said contract and the plans and specifications therein referred to.

NOW, THEREFORE, if the said Contractor shall repair, replace and restore any and all defects in or damages to said construction, occasioned by, and resulting within one (1) year from and after the day of the acceptance of said work by said City of Longview from defects in materials furnished by, or workmanship of the Contractor, in performing the work covered by said contract, then this obligation shall become null and void, and shall be of no further force and effect; otherwise, the same is to remain in full force and effect.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument on the respective dates written below their signatures.

ATTEST/SEAL: (if a corporation)

WITNESS: (if not a corporation)

(Principal)

Name _____
Title _____

Name _____
Title _____
Date _____

(Full Name of Surety)

ATTEST/WITNESS:

Name _____
Title _____

Name _____
Title _____
Date _____

CERTIFICATE OF INSURANCE
(INSERT FORMS HERE)

GENERAL CONDITIONS OF AGREEMENT

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GENERAL CONDITIONS OF AGREEMENT

1. DEFINITIONS OF TERMS

1.01 OWNER, CONTRACTOR AND ENGINEER. The OWNER, the CONTRACTOR, and the ENGINEER are those persons or organizations identified as such in the Agreement and are referred to throughout the contract Documents as if singular in number and masculine in gender. The term ENGINEER means the ENGINEER or his duly authorized representative. The ENGINEER shall be understood to be the ENGINEER of the OWNER, and nothing contained in the Contract Documents shall create any contractual or agency relationship between the ENGINEER and the CONTRACTOR.

1.02 CONTRACT DOCUMENTS. The Contract Documents shall consist of the Notice to Contractors (Advertisement), Special Conditions (Instructions to Bidders), Proposal, Signed Agreement, Performance and Payment Bonds (when required), Special Bonds (when required), General Conditions of the Agreement, Plans, Technical Specifications, and all modifications thereof incorporated in any of the documents before the execution of the agreement.

The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. In case of conflict between any of the Contract Documents, priority of interpretation shall be in the following order: Signed Agreement, Performance and Payment Bonds, Special Bonds (if any), Proposal, Special Conditions of Agreement, Notice to Contractors, Technical Specifications, Plans, and General Conditions of Agreement.

1.03 SUB-CONTRACTOR. The term Sub-Contractor, as employed herein, includes only those having a direct contract with the CONTRACTOR and it includes one who furnished material worked to a special design according to the plans or specifications of this work, but does not include one who merely furnished material not so worked.

1.04 WRITTEN NOTICE. Written notice shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, delivered by electronic fax, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

1.05 WORK. The CONTRACTOR shall provide and pay for all materials, supplies, machinery, equipment, tools, superintendence, labor, services, insurance, and all water, light, power, fuel, transportation and other facilities necessary for the execution and completion of the work covered by the contract documents. Unless otherwise specified, all materials shall be new and both workmanship and materials shall be of a good quality. The CONTRACTOR shall, if required, furnish satisfactory evidence as to the kind and quality of materials. Materials or work described in words which so applied have a well known technical or trade meaning shall be held to refer to such recognized standards.

1.06 EXTRA WORK. The term "Extra Work" as used in this contract shall be understood to mean and include all work that may be required by the ENGINEER or OWNER to be done by the CONTRACTOR to accomplish any change, alteration or addition to the work shown upon the plans, or reasonably implied by the specifications, and not covered by the CONTRACTOR'S proposal, except as provided under "Changes and Alterations", herein.

1.07 WORKING DAY. A "Working Day" is defined as any day not including Saturdays, Sundays or any legal holidays, in which weather or other conditions, not under the control of the CONTRACTOR, will permit construction of the principal units of the work for a period of not less than seven (7) hours between 7:00 a.m. and 6:00 p.m.

1.08 CALENDAR DAY. "Calendar Day" is any day of the week or month, no days being excepted.

1.09 SUBSTANTIALLY COMPLETED. By the term "substantially completed" is meant that the structure has been made suitable for use or occupancy or the facility is in condition to serve its intended purpose, but still may require minor miscellaneous work and adjustment.

2. RESPONSIBILITIES OF THE ENGINEER AND THE CONTRACTOR.

2.01 OWNER-ENGINEER RELATIONSHIP. The ENGINEER will be the OWNER'S representative during construction. The duties, responsibilities and limitations of authority of the ENGINEER as the OWNER'S representative during construction are as set forth in the Contract Documents and shall not be extended or limited without written consent of the OWNER and ENGINEER. The ENGINEER will advise and consult with the OWNER, and all of OWNER'S instructions to the CONTRACTOR shall be issued through the ENGINEER.

2.02 PROFESSIONAL INSPECTION BY ENGINEER. The ENGINEER shall make periodic visits to the site to familiarize himself generally with the progress of the executed work and to determine if such work generally meets the essential performance and design features and the technical and functional engineering requirements of the Contract documents; provided and except, however, that the ENGINEER shall not be responsible for making any detailed, exhaustive, comprehensive or continuous on-site inspection of the quality or quantity of the work or be in any way responsible, directly or indirectly, for the construction means, methods, techniques, sequences, quality, procedures, programs, safety precautions or lack of same incident thereto or in connection therewith. Notwithstanding any other provision of this agreement or any other contract document, the ENGINEER shall not be in any way responsible or liable for any acts, errors, omissions, or negligence of the CONTRACTOR, any subcontractor or any of the CONTRACTOR'S or subcontractor's agents, servants or employees or any other person, firm or corporation performing or attempting to perform any of the work.

2.03 PAYMENTS FOR WORK. The ENGINEER shall review CONTRACTOR'S applications for payment and supporting data, determine the amount owed to the CONTRACTOR and recommend to OWNER, in writing, payment to CONTRACTOR in such amounts. Such recommendation of payment of CONTRACTOR'S application for payment constitutes a representation to the OWNER of ENGINEER'S professional judgement that the work has progressed to the point indicated to the best of his knowledge, information and belief, but such recommendation of payment of an application for payment to CONTRACTOR shall not be deemed as a representation by ENGINEER that ENGINEER has made any examination to determine how or for what purpose CONTRACTOR has used the moneys paid on account of the Contract price. Further, ENGINEER's determination of the amount owed to the CONTRACTOR and recommendation of payment shall both be advisory only and shall not be binding upon OWNER.

2.04 DISPUTE DETERMINATIONS. The ENGINEER initially shall determine all claims, disputes and other matters in question between the CONTRACTOR and the OWNER

relating to the execution or progress of the work or the interpretation of the Contract Documents and the ENGINEER'S decision shall be rendered in writing within a reasonable time.

2.05 LINES AND GRADES. Unless otherwise specified, all lines and grades shall be furnished by the ENGINEER or his representative. Whenever necessary, construction work shall be suspended to permit performance of this work, but such suspension will be as brief as practicable and the CONTRACTOR shall be allowed no extra compensation therefor. The CONTRACTOR shall give the ENGINEER ample notice of the time and place where lines and grades will be needed. All stakes, marks, etc., shall be carefully preserved by the CONTRACTOR, and in case of careless destruction or removal by him or his employees, such stakes, marks, etc., shall be replaced at the CONTRACTOR'S expense.

2.06 CONTRACTOR'S DUTY AND SUPERINTENDENCE. The CONTRACTOR shall give adequate attention to the faithful prosecution and completion of this contract and shall keep on the work, during its progress, a competent superintendent and any necessary assistants. The superintendent shall represent the CONTRACTOR in his absence and all directions given to him shall be as binding as if given to the CONTRACTOR.

The CONTRACTOR is and at all times shall remain an independent contractor, solely responsible for the manner and method of completing his work under this contract, with full power and authority to select the means, method and manner of performing such work, so long as such methods do not adversely affect the completed improvements, the OWNER and ENGINEER being interested only in the result obtained and conformity of such completed improvements to the plans, specifications and contract.

Likewise, the CONTRACTOR shall be solely responsible for the safety of himself, his employees and other persons, as well as for the protection of the safety of the improvements being erected and the property of himself or any other person, as a result of his operations hereunder. Engineering construction drawings and specifications as well as any additional information concerning the work to be performed passing from or through the ENGINEER shall not be interpreted as requiring or allowing CONTRACTOR to deviate from the plans and specifications, the intent of such drawings, specifications and any other such instructions being to define with particularity the agreement of the parties as to the work the CONTRACTOR is to perform. CONTRACTOR shall be fully and completely liable, at his own expense, for design, construction, installation and use, or non-use, of all items and methods incident to performance of the contract, and for all loss, damage or injury incident thereto, either to person or property, including, without limitation, the adequacy of all temporary supports, shoring, bracing, scaffolding, machinery or equipment, safety precautions or devices, and similar items or devices used by him during construction.

Any review of work in process, or any visit or observation during construction, or any clarification of plans and specifications, by the ENGINEER, or any agent, employee, or representative of either of them, whether through personal observation on the project site or by means of approval of shop drawings for temporary construction or construction processes, or by other means or method, is agreed by the CONTRACTOR to be for the purpose of observing the extent and nature of work completed or being performed, as measured against the drawings and specifications constituting the contract, or for the purpose of enabling CONTRACTOR to more fully understand the plans and specifications so that the completed construction work will conform thereto, and shall in no way relieve the CONTRACTOR from full and complete responsibility for the proper performance of his work on the project, including but without

limitation the propriety of means and methods of the CONTRACTOR in performing said contract, and the adequacy of any designs, plans or other facilities for accomplishing such performance. Deviation by the CONTRACTOR from plans and specifications that may have been in evidence during any such visitation or observation by the ENGINEER, or any of his representatives, whether called to the CONTRACTOR'S attention or not shall in no way relieve CONTRACTOR from his responsibility to complete all work in accordance with said plans and specifications.

2.07 CONTRACTOR'S UNDERSTANDING. It is understood and agreed that the CONTRACTOR has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agent or employee of the OWNER or ENGINEER either before or after the execution of this contract, shall affect or modify any of the terms or obligations herein contained.

2.08 CHARACTER OF WORKMEN. The CONTRACTOR agrees to employ only orderly and competent men, skillful in the performance of the type of work required under this contract, to do the work; and agrees that whenever the ENGINEER shall inform him in writing that any man or men on the work are, in his opinion, incompetent, unfaithful or disorderly, such man or men shall be discharged from the work and shall not again be employed on the work without the ENGINEER'S written consent.

2.9 CONTRACTOR'S BUILDINGS. The building of structures for housing men, or the erection of tents or other forms of protection, will be permitted only at such places as the ENGINEER shall direct, and the sanitary conditions of the grounds in or about such structures shall at all times be maintained in a manner satisfactory to the ENGINEER.

2.10 SANITATION. Necessary conveniences for the use of laborers on the work, properly secluded from public observation, shall be constructed and maintained by the CONTRACTOR in such manner and at such points as shall be approved by the ENGINEER, and their use shall be strictly enforced.

2.11 SHOP DRAWINGS. The CONTRACTOR shall submit to the ENGINEER, with such promptness as to cause no delay in his own work or in that of any other Contractor, four checked copies, unless otherwise specified, of all shop and/or setting drawings and schedules required for the work of the various trades, and the ENGINEER shall pass upon them with reasonable promptness, making desired corrections. The CONTRACTOR shall make any corrections required by the ENGINEER, file with him two corrected copies and furnish such other copies as may be needed. The ENGINEER'S approval of such drawings or specification, unless he has in writing called the ENGINEER'S attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules. It shall be the CONTRACTOR'S responsibility to fully and completely review all shop drawings to ascertain their effect on his ability to perform the required contract work in accordance with the plans and specifications and within the contract time.

Such review by the ENGINEER shall be for the sole purpose of determining the sufficiency of said drawings or schedules to result in finished improvements in conformity with the plans and specifications, and shall not relieve the CONTRACTOR of his duty as an independent

contractor as previously set forth, it being expressly understood and agreed that the ENGINEER does not assume any duty to pass upon the propriety or adequacy of such drawings or schedules, or any means or methods reflected thereby, in relation to the safety of either person or property during CONTRACTOR'S performance hereunder.

2.12 PRELIMINARY APPROVAL. The ENGINEER shall not have the power to waive the obligations of this contract for the furnishing by the CONTRACTOR of good material, and of his performing good work as herein described, and in full accordance with the plans and specifications. No failure or omission of the ENGINEER to discover, object to or condemn any defective work or material shall release the CONTRACTOR from the obligations to fully and properly perform the contract, including without limitations, the obligation to at once tear out, remove and properly replace the same at any time prior to final acceptance upon the discovery of said defective work or material; provided, however, that the ENGINEER shall, upon request of the CONTRACTOR, inspect and accept or reject any material furnished, and in event the material has been once accepted by the ENGINEER, such acceptance shall be binding on the OWNER, unless it can be clearly shown that such material furnished does not meet the specifications for this work.

Any questioned work may be ordered taken up or removed for re-examination, by the ENGINEER, prior to final acceptance, and if found not in accordance with the specifications for said work, all expense of removing, re-examination and replacement shall be borne by the CONTRACTOR, otherwise the expense thus incurred shall be allowed as EXTRA WORK, and shall be paid for by the OWNER; provided that, where inspection or approval is specifically required by the specifications prior to performance of certain work, should the CONTRACTOR proceed with such work without requesting prior inspection or approval he shall bear all expense of taking up, removing, and replacing this work if so directed by the ENGINEER.

2.13 DEFECTS AND THEIR REMEDIES. It is further agreed that if the work or any part thereof, or any material brought on the site of the work for use in the work or selected for the same, shall be deemed by the ENGINEER as unsuitable or not in conformity with the specifications, the CONTRACTOR shall, after receipt of written notice thereof from the ENGINEER, forthwith remove such material and rebuild or otherwise remedy such work so that it shall be in full accordance with this contract.

2.14 CHANGES AND ALTERATIONS. The CONTRACTOR further agrees that the OWNER may make such changes and alterations as the OWNER may see fit, in the line, grade, form, dimensions, plans or materials for the work herein contemplated, or any part thereof, either before or after the beginning of the construction, without affecting the validity of this contract and the accompanying Performance, Payment, and Maintenance Bonds.

If such changes or alterations diminish the quality of the work to be done, they shall not constitute the basis for a claim for damages, or anticipated profits on the work that may be dispensed with, except as provided for unit price items under Section 5 "Measurement and Payment." If the amount of work is increased, and the work can fairly be classified under the specifications, such increase shall be paid for according to the quantity actually done and at the unit price, if any, established for such work under this contract, except as provided for unit price items under Section 5 "Measurement and Payment;" otherwise, such additional work shall be paid for as provided under Extra Work. In case the OWNER shall make such changes or alterations as shall make useless any work already done or material already furnished or used in said work, then the OWNER shall recompense the CONTRACTOR for any material or labor so

used, and for any actual loss occasioned by such change, due to actual expenses incurred in preparation for the work as originally planned.

3. GENERAL OBLIGATIONS AND RESPONSIBILITIES

3.01 KEEPING PLANS AND SPECIFICATIONS ACCESSIBLE. The ENGINEER shall furnish the CONTRACTOR with an adequate and reasonable number of copies of all plans and specifications without expense to him, and the CONTRACTOR shall keep one copy of the same constantly accessible on the work, with the latest revisions noted thereon.

3.02 OWNERSHIP OF DRAWINGS. All drawings, specifications and copies thereof furnished by the ENGINEER shall not be reused on other work, and, with the exception of the signed contract sets, are to be returned to him on request, at the completion of the work. All models are the property of the OWNER.

3.03 ADEQUACY OF DESIGN. It is understood that the OWNER believes it has employed competent engineers and designers. It is, therefore, agreed that the OWNER shall be responsible for the adequacy of the design, sufficiency of the Contract Documents, the safety of the structure and the practicability of the operations of the completed project; provided the CONTRACTOR has complied with the requirements of the said Contract Documents, all approved modifications thereof, and additions and alterations thereto approved in writing by the OWNER. The burden of proof of such compliance shall be upon the CONTRACTOR to show that he has complied with the said requirements of the Contract Documents, approved modifications thereof and all approved additions and alterations thereto.

3.04 RIGHT OF ENTRY. The OWNER reserves the right to enter the property or location on which the works herein contracted for are to be constructed or installed, by such agent or agents as he may elect, for the purpose of inspecting the work, or for the purpose of constructing or installing such collateral work as said OWNER may desire.

3.05 COLLATERAL CONTRACTS. The OWNER agrees to provide by separate contract or otherwise, all labor and material essential to the completion of the work specifically excluded from this contract, in such manner as not to delay the progress of the work, or damage said CONTRACTOR, except where such delays are specifically mentioned elsewhere in the Contract Documents.

3.06 DISCREPANCIES AND OMISSIONS. It is further agreed that it is the intent of this contract that all work must be done and all material must be furnished in accordance with the generally accepted practice, and in the event of any discrepancies between the separate contract documents, the priority of interpretation defined under "Contract Documents" shall govern. In the event that there is still any doubt as to the meaning and intent of any portion of the contract, specifications or drawings, the ENGINEER shall define which is intended to apply to the work.

3.07 EQUIPMENT, MATERIALS AND CONSTRUCTION PLANT. The CONTRACTOR shall be responsible for the care, preservation, conservation, and protection of all materials, supplies, machinery, equipment, tools, apparatus, accessories, facilities, all means of construction, and any and all parts of the work, whether the CONTRACTOR has been paid, partially paid, or not paid for such work, until the entire work is completed and accepted.

3.08 DAMAGES. In the event the OWNER is damaged in the course of the work by the act,

negligence, omission, mistake or default of the CONTRACTOR, or should the CONTRACTOR unreasonably delay the progress of the work being done by others on the job so as to cause loss for which the OWNER becomes liable, then the CONTRACTOR shall reimburse the OWNER for such loss.

3.09 PROTECTION AGAINST ACCIDENT TO EMPLOYEES AND THE PUBLIC. The CONTRACTOR shall at all times exercise reasonable precautions for the safety of employees and others on or near the work and shall comply with all applicable provisions of Federal, State, and Municipal safety laws and building and construction codes. All machinery and equipment and other physical hazards shall be guarded in accordance with the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America except where incompatible with Federal, State, or Municipal laws or regulations. The CONTRACTOR shall provide such machinery guards, safe walkways, ladders, bridges, gangplanks, and other safety devices. The safety precautions actually taken and their adequacy shall be the sole responsibility of the CONTRACTOR, acting at his discretion as an independent contractor.

3.10 PERFORMANCE, PAYMENT & MAINTENANCE BONDS. Unless otherwise specified, it is further agreed by the parties to this Contract that the CONTRACTOR will execute separate performance, payment, and maintenance bonds, each in the sum of one hundred (100) percent of the total contract price, in standard forms for this purpose, guaranteeing faithful performance of the work and the fulfillment of any guarantees required, and further guaranteeing payment to all persons supplying labor and materials or furnishing him any equipment in the execution of the contract, and it is agreed that this Contract shall not be in effect until such performance, payment, and maintenance bonds are furnished and approved by the OWNER.

Unless otherwise approved in writing by the OWNER, the surety company underwriting the bonds shall be acceptable according to the latest list of companies holding certificates of authority from the Secretary of the Treasury of the United States.

Unless otherwise specified, the cost of the premium for the performance and payment bonds shall be included in the CONTRACTOR'S proposal

3.11 LOSSES FROM NATURAL CAUSES. Unless otherwise specified, all loss or damage to the CONTRACTOR arising out of the nature of the work to be done, or from the action of the elements, or from any unforeseen circumstance in the prosecution of the same, or from unusual obstructions or difficulties which may be encountered in the prosecution of the work, shall be sustained and borne by the CONTRACTOR at his own cost and expense.

3.12 PROTECTION OF ADJOINING PROPERTY. The said CONTRACTOR shall take proper means to protect the adjacent or adjoining property or properties in any way encountered, which might be injured or seriously affected by any process of construction to be undertaken under this Agreement, from any damage or injury by reason of said process of construction; and he shall be liable for any and all claims for such damage on account of his failure to fully protect all adjoining property. The CONTRACTOR agrees to indemnify, save and hold harmless the OWNER and ENGINEER against any claim or claims for damages due to any injury to any adjacent or adjoining property, arising or growing out of the performance of the contract; but any such indemnity shall not apply to any claim of any kind arising out of the existence or character of the work.

3.13 PROTECTION AGAINST CLAIMS OF SUB-CONTRACTORS, LABORERS, MATERIALMEN AND FURNISHERS OF MACHINERY, EQUIPMENT AND SUPPLIES. The CONTRACTOR agrees that he will indemnify and save the OWNER and ENGINEER harmless from all claims growing out of the lawful demands of sub-contractors, laborers, workmen, mechanics, materialmen and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. When so desired by the OWNER, the CONTRACTOR shall furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged or waived. If the CONTRACTOR fails so to do, then the OWNER may at the option of the CONTRACTOR either pay directly any unpaid bills of which the OWNER has written notice, or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to liquidate any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payments to the CONTRACTOR shall be resumed in full, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligation upon the OWNER by either the CONTRACTOR or his Surety.

3.14 PROTECTION AGAINST ROYALTIES OR PATENTED INVENTION. The CONTRACTOR shall pay all royalties and license fees, and shall provide for the use of any design, device, material or process covered by letters patent or copyright by suitable legal agreement with the patentee or owner. The CONTRACTOR shall defend all suits or claims for infringement of any patent or copyright rights and shall indemnify and save the OWNER and ENGINEER harmless from any loss on account thereof, except that the OWNER shall defend all such suits and claims and shall be responsible for all such loss when a particular design, device, material or process or the product of a particular manufacturer or manufacturers is specified or required by the OWNER; provided, however, if choice of alternate design, device, material or process is allowed to the CONTRACTOR, then CONTRACTOR shall indemnify and save OWNER harmless from any loss on account thereof. If the material or process specified or required by the OWNER is an infringement, the CONTRACTOR shall be responsible for such loss unless he promptly gives such information to the OWNER.

3.15 LAWS AND ORDINANCES. The CONTRACTOR shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations, which in any manner affect the contract or the work, and shall indemnify and save harmless the OWNER and ENGINEER against any claim arising from the violation of any such laws, ordinances, and regulations whether by the CONTRACTOR or his employees, except where such violations are called for by the provisions of the contract Documents. If the CONTRACTOR observes that the plans and specifications are at variance therewith, he shall promptly notify the ENGINEER in writing, and any necessary changes shall be adjusted as provided in the contract for changes in the work. If the CONTRACTOR performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the ENGINEER, he shall bear all costs arising therefrom. In case the OWNER is a body politic and corporate, the law from which it derives its powers, insofar as the same regulates the objects for which, or the manner in which, or the conditions under which the OWNER may enter into contract, shall be controlling, and shall be considered as part of this contract, to the same effect as though embodied herein.

3.16 ASSIGNMENT AND SUBLETTING. The CONTRACTOR further agrees that he will retain personal control and will give his personal attention to the fulfillment of this contract and that he will not assign by Power of Attorney, or otherwise, or sublet said contract without the written consent of the ENGINEER, and that no part or feature of the work will be sublet to

anyone objectionable to the ENGINEER or the OWNER. The CONTRACTOR further agrees that the subletting of any portion or feature of the work, or materials required in the performance of this contract, shall not relieve the CONTRACTOR from his full obligations to the OWNER, as provided by this Agreement.

3.17 INDEMNIFICATION. The CONTRACTOR shall defend, indemnify and hold harmless the OWNER and the ENGINEER and their respective officers, agents and employees, from and against all damages, claims, losses, demands, suits, judgments and costs, including reasonable attorneys' fees and expenses, arising out of or resulting from the performance of the work, provided that any such damages, claim, loss, demand, suit, judgment, cost or expense:

- (1) is attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom; and,
- (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any one of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

The obligation of the CONTRACTOR under this Paragraph shall not extend to the liability of the ENGINEER, his agents or employees arising out of the preparation or approval of maps, drawings, reports, surveys, Change Orders, designs or specifications, or the giving of or the failure to give directions or instructions by the ENGINEER, his agents or employees, provided such giving or failure to give is the primary cause of the injury or damage.

3.18 INSURANCE. The CONTRACTOR at his own expense shall purchase, maintain and keep in force such insurance as will protect him from claims set for the below which may arise out of or result from the CONTRACTOR'S operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- (1) workmen's compensation claims, disability benefits and other similar employee benefit acts;
- (2) claims for damages because of bodily injury, personal injury, occupational sickness or disease, or death of his employees, and claims insured by usual bodily injury liability coverages;
- (3) claims for damages because of bodily injury, personal injury, sickness or disease, or death of any person other than his employees, and claims insured by usual bodily injury liability coverages; and
- (4) claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

3.18.1 CERTIFICATE OF INSURANCE. Before commencing any of the work, CONTRACTOR shall file with the OWNER valid Certificates of Insurance acceptable to the OWNER and the ENGINEER. Such Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least ten days prior written notice has been given to the OWNER.

The CONTRACTOR shall also file with the OWNER valid Certificates of Insurance covering all sub-contractors.

4. PROSECUTION AND PROGRESS

4.01 TIME AND ORDER OF COMPLETION. It shall be the responsibility of the CONTRACTOR to commence work within ten(10) days after the date of written notice to proceed, and to diligently prosecute the project to completion within the time set out herein. This responsibility to proceed diligently shall not be interpreted as OWNER'S right to dictate CONTRACTOR'S order of precedence in performance of the work; provided, however, that the order and the time of prosecution shall be such that the work shall be substantially completed as a whole and in part, in accordance with this contract, the plans and specifications, and within the time of completion designated in the Proposal; provided, also, that when the OWNER is having other work done, either by contract or by his own force, the ENGINEER may direct the time and manner of constructing the work done under this contract, so that conflict will be avoided and the construction of the various works being done for the OWNER shall be harmonized.

The CONTRACTOR shall submit, at such times as may reasonably be requested by the ENGINEER, schedules which shall show the order in which the CONTRACTOR proposes to carry on the work, with dates at which the CONTRACTOR will start the several parts of the work, and estimated dates of completion of the several parts.

4.02 EXTENSION OF TIME. Should the CONTRACTOR be delayed in the completion of the work by any act or neglect of the OWNER or ENGINEER, or of any employee of either, or by other contractors employed by the OWNER, or by changes ordered in the work, or by strikes, lockouts, fires, and unusual delays by common carriers, or unavoidable cause or causes beyond the CONTRACTOR'S control, or by any cause which the ENGINEER shall decide justifies the delay, then an extension of time shall be allowed for completing the work, sufficient to compensate for the delay, the amount of the extension to be determined by the ENGINEER, provided, however, that the CONTRACTOR shall give the ENGINEER prompt notice in writing of the cause of such delay.

4.03 HINDRANCES AND DELAYS. No claims shall be made by the CONTRACTOR for damages resulting from hindrances or delays from any cause (except where the work is stopped by order of the OWNER) during the progress of any portion of the work embraced in this contract. In case said work shall be stopped by the act of the OWNER, then such expense as in the judgment of the ENGINEER is caused by such stoppage of said work shall be paid by the OWNER to the CONTRACTOR; provided, however, that OWNER shall not be responsible for damages attributable to work stoppages by OWNER in the instance of CONTRACTOR'S failure to timely perform as set out in Paragraph 7 of these General Conditions.

5. MEASUREMENT AND PAYMENT

5.01 QUANTITIES AND MEASUREMENTS. No extra or customary measurements of any kind will be allowed, but the actual measured and/or computed length, area, solid contents, number and weight only shall be considered, unless otherwise specifically provided.

5.02 ESTIMATED QUANTITIES. This agreement, including the specifications, plans and estimate, is intended to show clearly all work to be done and material to be furnished hereunder. where the estimated quantities are shown for the various classes of work to be done and material to be furnished under this contract, they are approximate and are to be used only as a basis for estimating the probable cost of the work and for comparing the proposals offered for the work. It is understood and agreed that the actual amount of work to be done and material to be furnished under this contract may differ somewhat from these estimates, and that where the basis for payment under this contract is the unit price method, payment shall be for the actual amount of such work done and the material furnished.

Where payment is based on the unit price method, the CONTRACTOR agrees that he will make no claim for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under this contract and the estimated quantities contemplated and contained in the proposal; provided, however, that in case the actual quantity of any major item should become as much as 20% more than, or 20% less than the estimated or contemplated quantity for such items, than either party to this Agreement, upon demand, shall be entitled to a revised consideration upon the portion of the work above or below 20% of the estimated quantity.

A "Major Item" shall be construed to be any individual bid item incurred in the proposal that has a total cost equal to or greater than five(5) percent of the total contract cost, computed on the basis of the proposal quantities and the contract unit prices.

Any revised consideration is to be determined by agreement between the parties, otherwise by the terms of this Agreement, as provided under "Extra Work".

5.03 PRICE OF WORK. In consideration of the furnishing of all the necessary labor, equipment and material, and the completion of all work by the CONTRACTOR, and on the completion of all work and of the delivery of all material embraced in this Contract in full conformity with the specifications and stipulations herein contained, the OWNER agrees to pay the CONTRACTOR the prices set forth in the Proposal hereto attached, which has been made a part of this contract. The CONTRACTOR hereby agrees to receive such prices in full for furnishing all material and all labor required for the aforesaid work, also for all expense incurred by him, and for well and truly performing the same and the whole thereof in the manner and according to this Agreement.

5.04 PARTIAL PAYMENTS. On or before the 10th day of each month, the CONTRACTOR shall prepare and submit to the ENGINEER a statement showing as completely as practicable the total value of the work done by the CONTRACTOR up to and including the last day of the preceding month; said statement shall also include the value of all sound materials delivered on the site of the work that are to be fabricated into the work. The ENGINEER shall review said statement and recommend to the OWNER approval, modification or rejection of same.

Within 30 consecutive calendar days after approval of the aforesaid statement by the OWNER, the OWNER shall pay the CONTRACTOR the total amount of the approved statement, less 10 percent of the amount thereof, which 10 percent shall be retained until final payment, and further less all previous payments and all further sums that may be retained by the OWNER under the terms of this Agreement. It is understood, however, that in case the whole work be near to completion and some unexpected and unusual delay occurs due to no fault or

neglect on the part of the CONTRACTOR, the OWNER may, upon written recommendation of the ENGINEER, pay a reasonable and equitable portion of the retained percentage to the CONTRACTOR; or the CONTRACTOR at the OWNER'S option, may be relieved of the obligation to fully complete the work and, thereupon, the CONTRACTOR shall receive payment of the balance due him under the contract subject only to the conditions stated under "Final Payment".

5.05 USE OF COMPLETED PORTIONS. The OWNER shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work or such portions may not have expired but such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost of or delays the work, the CONTRACTOR shall be entitled to such extra compensation, or extension of time, or both, as the ENGINEER may determine.

The CONTRACTOR shall notify the ENGINEER when, in the CONTRACTOR'S opinion, the contract is "substantially completed" and when so notifying the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER in writing a detailed list of unfinished work. The ENGINEER will review the CONTRACTOR'S list of unfinished work and will add thereto such items as the CONTRACTOR has failed to include. The "substantial completion" of the structure or facility shall not excuse the CONTRACTOR from performing all of the work undertaken, whether of a minor or major nature, and thereby completing the structure or facility in accordance with the Contract Documents.

5.06 FINAL COMPLETION AND ACCEPTANCE. Within ten(10) days after the CONTRACTOR has given the ENGINEER written notice that the work has been completed, or substantially completed, the ENGINEER and the OWNER shall inspect the work and within said time, if the work is found to be completed or substantially completed in accordance with the Contract Documents, the ENGINEER shall issue to the OWNER and the CONTRACTOR his Certificate of Completion, and thereupon shall place the project on the next available City Council agenda for final acceptance and approval of final payment.

5.07 FINAL PAYMENT. Upon the issuance of the Certificate of Completion, the ENGINEER shall proceed to make final measurements and prepare final statement of the value of all work performed and materials furnished under the terms of the Agreement and shall certify same to the OWNER, who shall pay to the CONTRACTOR, within 30 consecutive calendar days after formal acceptance of the completed project by the City Council, the balance due the CONTRACTOR under the terms of this Agreement, provided he has fully performed his contractual obligations under the terms of this contract; and said payment shall be come due in any event upon said performance by the CONTRACTOR. Neither the Certificate of Acceptance nor the final payment, nor any provision in the contract Documents, shall relieve the CONTRACTOR of the obligation for fulfillment of any warranty which may be required.

5.08 PAYMENTS WITHHELD. The OWNER may, on account of subsequently discovered evidence, withhold or nullify the whole or part of any certificate to such extent as may be necessary to protect himself from loss on account of:

- (a) defective work not remedied
- (b) claims filed or reasonable evidence indicating probable filing of claims
- (c) failure of the CONTRACTOR to make payments properly to subcontractors or for material

- or labor
- (d) damage to another contractor
- (e) reasonable doubt that the work can be completed for the unpaid balance of the contract amount
- (f) reasonable indication that the work will not be completed within the contract time

When the above grounds are removed or the CONTRACTOR provides a Surety Bond satisfactory to the OWNER, which will protect the OWNER in the amount withheld, payment shall be made for amounts withheld because of them.

5.09 DELAYED PAYMENTS. Should the OWNER fail to make payment to the CONTRACTOR of the sum named in any partial or final statement, when payment is due, then the OWNER shall pay to the CONTRACTOR, in addition to the sum shown as due by such statement, interest thereon at the rate of six(6) percent per annum, unless otherwise specified, from date due as provided under "Partial Payments" and "Final Payments", until fully paid, which shall fully liquidate any injury to the CONTRACTOR growing out of such delay in payment.

6. EXTRA WORK AND CLAIMS

6.01 CHANGE ORDERS. Without invalidating this Agreement, the OWNER may, at any time or from time to time, order additions, deletions or revisions to the work; such changes will be authorized by Change Order to be prepared by the ENGINEER for execution by the OWNER and the CONTRACTOR. The Change Order shall set forth the basis for any change in contract price, as hereinafter set forth for Extra Work, and any change in contract time which may result from the change.

In the event the CONTRACTOR shall refuse to execute a Change Order which has been prepared by the ENGINEER and executed by the OWNER, the ENGINEER may in writing instruct the CONTRACTOR to proceed with the work as set for the in the Change Order and the CONTRACTOR may make claim against the OWNER for Extra Work involved therein, as hereinafter provided.

6.02 MINOR CHANGES. The ENGINEER may authorize minor changes in the work not inconsistent with the overall intent of the Contract Documents and not involving an increase in Contract Price. If the CONTRACTOR believes that any minor change or alteration authorized by the ENGINEER involves Extra Work and entitles him to an increase in the Contract Price, the CONTRACTOR shall make written request to the ENGINEER for a written Field Order.

In such case, the CONTRACTOR by copy of his communication to the ENGINEER or otherwise in writing shall advise the OWNER of his request to the ENGINEER for a written Field Order and that the work involved may result in an increase in the Contract Price.

Any request by the CONTRACTOR for a change in Contract Price shall be made prior to beginning the work covered by the proposed change.

6.03 EXTRA WORK. It is agreed that the basis of compensation to the CONTRACTOR for work either added or deleted by a Change Order or for which a claim for Extra Work is made shall be determined by one or more of the following methods:

Method (A): by agreed unit prices; or

Method (B): by agreed lump sum; or

Method (C): if neither Method (A) nor Method (B) be agreed upon before the Extra Work is commenced, then the CONTRACTOR shall be paid the "actual field cost" of the work, plus fifteen (15) percent.

In the event said Extra Work be performed and paid for under Method (C), then the provisions of this paragraph shall apply and the "actual field cost" is hereby defined to include the cost to the CONTRACTOR of all workmen, such as foreman, timekeepers, mechanics and laborers, and materials, supplies, teams, trucks, rentals on machinery and equipment, for the time actually employed or used on such Extra Work, plus actual transportation charges necessarily incurred, together with all power, fuel, lubricants, water and similar operating expenses, also all necessary incidental expenses incurred directly on account of such Extra Work, including Social Security, Old Age Benefits, and other payroll taxes, and, a rateable proportion of premiums on Performance, Payment, and Maintenance Bonds, Public Liability and Property Damage and Workmen's Compensation, and all other insurance as may be required by any law or ordinance, or directed by the OWNER, or by them agreed to. The ENGINEER may direct the form in which accounts of the "actual field cost" shall be kept and the records of these accounts shall be made available to the ENGINEER. The ENGINEER or OWNER may also specify in writing, before the work commences, the method of doing the work and the type and kind of machinery and equipment to be used; otherwise these matters shall be determined by the CONTRACTOR. Unless otherwise agreed upon, the prices for the use of machinery and equipment shall be determined by using 100 percent, unless otherwise specified, of the latest schedule of Equipment Ownership Expense adopted by the Associated General Contractors of America. Where practicable the terms and prices for the use of machinery and equipment shall be incorporated in the Written Extra Work Order. The fifteen (15%) percent of the "actual field cost" to be paid the CONTRACTOR shall cover and compensate him for his profit, overhead, general superintendence and field office expense, and all other elements of cost and expense not embraced within the "actual field cost" as herein defined, save that where the CONTRACTOR'S Camp or Field Office must be maintained primarily on account of such Extra work; then the cost to maintain and operate the same shall be included in the "actual field cost".

No claim for Extra work of any kind will be allowed unless ordered in writing by the ENGINEER. In case any orders or instructions, either oral or written, appear to the CONTRACTOR to involve Extra Work for which he should receive compensation or an adjustment in the construction time, he shall make written request to the ENGINEER for written order authorizing such Extra Work. Should a difference of opinion arise as to what does or does not constitute Extra Work, or as to the payment therefor, and the ENGINEER insists upon its performance, the CONTRACTOR shall proceed with the work after making written request for written order and shall keep an accurate account of the "actual field cost" thereof, as provided under Method (C).

6.04 TIME OF FILING CLAIMS. It is further agreed by both parties hereto that all questions of dispute or adjustment presented by the CONTRACTOR shall be in writing and filed with the ENGINEER within thirty (30) days after the ENGINEER has given any directions, order or instruction to which the CONTRACTOR desires to take exception. The ENGINEER shall reply within thirty (30) days to such written exceptions by the CONTRACTOR and render his final decision in writing. It is further agreed that final acceptance of the work by the

OWNER and the acceptance by the CONTRACTOR of the final payment shall be a bar to any claims by either party, except where noted otherwise in the Contract Documents. Contractor's failure to timely comply with the time limitations set out herein shall waive any entitlement to dispute or adjustment.

7. CONTRACTOR'S TIMELY PERFORMANCE

7.01 CONTRACTOR'S OBLIGATION TO TIMELY PERFORM. In case the CONTRACTOR should abandon or otherwise fail or refuse to commence, continue, or resume work within ten (10) days after written notification from the OWNER, or the ENGINEER, or if the CONTRACTOR fails to comply with the orders of the ENGINEER, when such orders are consistent with the Contract Documents, then, and in that case, where performance and payment bonds exist, the Sureties on these bonds shall be notified in writing and directed to complete the work, and a copy of said notice shall be delivered to the CONTRACTOR.

7.02 OWNER'S IMMEDIATE REMEDY. After receiving said notice of failure to perform the CONTRACTOR shall not remove from the work any machinery, equipment, tools, materials, or supplies then on the job, but the same, together with any materials and equipment under contract for the work, may be held for use on the work by the OWNER or the Surety on the performance bond, or another contractor in completion of the work; and the CONTRACTOR shall not receive any rental or credit therefor (except when used in connection with extra work, where credit shall be allowed as provided for under Section 6, Extra Work and Claims), it being understood that the use of such equipment and materials will ultimately reduce the cost to complete the work and be reflected in the final settlement.

7.03 OWNER'S ADDITIONAL REMEDIES. Where there is no performance bond provided or in case the Surety should fail to commence compliance with the notice of failure to perform hereinbefore provided for, within ten (10) days after service of such notice, then the OWNER may provide for completion of the work in either of the following elective manners:

7.03.1 The OWNER may thereupon employ such force of men and use such machinery, equipment, tools, materials and supplies as said OWNER may deem necessary to complete the work and charge the expense of such labor, machinery, equipment, tools, materials and supplies to said CONTRACTOR, and expense so charged shall be deducted and paid by the OWNER out of such moneys as may be due, or that may thereafter at any time become due to the CONTRACTOR under and by virtue of this Agreement. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by the CONTRACTOR, then said CONTRACTOR shall receive the difference. In case such expense is greater than the sum which would have been payable under this contract, if the same had been completed by said CONTRACTOR, then the CONTRACTOR and/or his Surety shall pay the amount of such excess to the OWNER; or

7.03.2 In the instance of CONTRACTOR'S failure to perform in the commencement of the contract, and if bids remain outstanding and enforceable from the original bid process, OWNER may award the contract to the next qualified low bidder who will accept the contract. If all bids have expired or no qualified bidder will accept the work, then the OWNER under sealed bids, after five (5) days notice published one or more times in a newspaper having general circulation in the county of the location of the work, may let the contract for the completion of the work under substantially the same terms and conditions which are provided in this contract. In case any increase in cost to the OWNER under the new contract as compared to what would have

been the cost under this contract, such increase shall be charged to the CONTRACTOR and the Surety shall be and remain bound therefor. However, should the cost to complete any such new contract prove to be less than what would have been the cost to compete under this contract, the CONTRACTOR and/or his Surety shall be credited therewith.

When the work has been substantially completed, the CONTRACTOR and his Surety shall be so notified and Certificates of Completion and Acceptance, as provided in Paragraph 5.06 hereinabove, shall be issued. A complete itemized statement of the contract accounts, certified to by the ENGINEER as being correct, shall then be prepared and delivered to the CONTRACTOR and his Surety, whereupon the CONTRACTOR and/or his Surety, or the OWNER as the case may be, shall pay the balance due as reflected by said statement, within fifteen (15) days after the date of such Certificate of Completion.

In the event the statement of accounts shows that the cost to complete the work is less than that which would have been the cost to the OWNER had the work been completed by the CONTRACTOR under the terms of this contract; or when the CONTRACTOR and/or his Surety shall pay the balance shown to be due by them to the OWNER, then all machinery, equipment, tools, materials, or supplies left on the site of the work shall be turned over to the CONTRACTOR and/or his Surety. Should the cost to complete the work exceed the contract price, and the CONTRACTOR and/or his Surety fail to pay the amount due the OWNER within the time designated hereinabove, and there remains any machinery, equipment, tools, materials, or supplies on the site of the work, notice thereof, together with an itemized list of such equipment and materials, shall be mailed to the CONTRACTOR and his Surety at the respective addresses designated in this contract, provided, however, that actual written notice given in any manner will satisfy this condition. After mailing, or other giving of such notice, such property shall be held at ordinary care to protect such property. After fifteen (15) days from the date of said notice the OWNER may sell such machinery, equipment, tools, materials, or supplies and apply the net sum derived from such sale to the credit of the CONTRACTOR and his Surety. Such sale may be made at either public or private sale, with or without notice, as the OWNER may elect. The OWNER shall release any machinery, equipment, tools, materials, or supplies, which remain on the work, and belong to persons other than the CONTRACTOR or his Surety, to their proper owners. The books on all operations provided herein shall be open to the CONTRACTOR and his Surety.

7.04 The remedies set herein for CONTRACTOR'S failure to timely perform shall not be exclusive; OWNER shall be entitled to exercise any and all other remedies under this contract or available to OWNER at law or in equity, in the event of CONTRACTOR'S failure to timely perform.

SPECIAL CONDITIONS OF AGREEMENT

SPECIAL CONDITIONS OF AGREEMENT

SP-1. LINES AND GRADES. The construction plans include a horizontal control line (baseline) and vertical control points (bench marks). These have been established in the field and will be re-established or shown to the Contractor prior to commencing construction. After construction has started, the Contractor shall be responsible for protecting and preserving these controls. From these controls, the Contractor shall stake all alignments for the work and will be responsible for all horizontal and vertical construction staking.

SP-2. SUPERINTENDENCE. The Contractor or his appointed Superintendent(s) shall provide proper superintendence for this entire project. Correspondence, questions concerning the project, interpretations and instructions shall be to or through the Contractor or the Superintendent. The Engineer will not in any manner supervise the Contractor's workmen or subcontractors. The Contractor or his Superintendent shall be on the job site whenever work is in progress.

SP-3. PROJECT MAINTENANCE. The project area shall be maintained by the Contractor in a neat, passable condition. Vehicular access shall be maintained to every house and adjacent property. The Contractor shall provide a crew to maintain streets and driveways during holidays and weekends for the period of this contract.

SP-4. EXTENSION OF TIME. The Contractor may make written request for an extension of time because of acts of God, acts of war, strikes, or unavailability of materials because of failure of the manufacturer or transporter. The Contractor shall support, by written evidence, any claim for a time extension because of any delay in receipt of material. An extension of time will not be granted for normal material delivery times, or failure of the Contractor to act properly toward the timely completion of the project.

Upon written request, additional contract time will be granted only for the number of days that exceed the National Climatic Data Center's historical average number of days of rainfall of 0.1". Rain days shall be defined as a day with 0.1" or more of measured rainfall, as measured at the Gregg County Airport.

SP-5. INSURANCE. The Contractor shall not commence work under this contract until he has obtained at his expense all insurance required under this section of the Special Provisions and by the Contract Documents and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on any subcontract until all similar insurance required of the subcontractor has been so obtained and approved. Such insurance shall remain in full force and effect on all phases of the work, whether or not the work is

occupied or utilized by the Owner, until all work under the Contract is completed and has been accepted by the Owner.

Nothing contained in the insurance requirements shall be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from his operations under the Contract.

Any insurance bearing an adequacy of performance will be maintained after completion of the project for the full guarantee period.

The Contractor shall obtain and maintain for the full period of the Contract the following types of insurance in the form, minimum limits and amounts herein specified or as may be otherwise required in the Contract Documents. The Contractor shall automatically renew any policy which expires during the performance of his Contract and notify the Owner and Engineer of such a renewal prior to expiration date.

A. Workmen's Compensation including Occupational Disease, and Employer's Liability Insurance.

Definitions:

Certificate of coverage ("certificate") - a copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

Duration of the project - includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

Persons providing services on the project ("subcontractor" in 406.096) - includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor,

transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

The contractor shall provide coverage, on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

The contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

1. a certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and
2. no later than seven days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

The contractor shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

The contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

The contractor shall contractually require each person with whom it contracts to provide services on a project, to:

1. provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;
2. provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;
3. provide the contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
4. obtain from each other person with whom it contracts, and provide to the contractor:
 - (a) a certificate of coverage, prior to the other person beginning work on the project, and
 - (b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
5. retain all required certificates of coverage on file for the duration of the project and for one year thereafter;
6. notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and
7. contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), with the certificate of coverage to be provided to the person for whom they are providing services.

By signing this contract or providing or causing to be provided a certificate of coverage, the contractor is representing to the governmental entity that all employees of the contractor who will provide services on the

project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

The contractor's failure to comply with any of these provisions is a breach of contract by the contractor which entitles the governmental entity to declare the contract void if the contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

B. Public Liability Insurance. (Note "Indemnity" clause hereinafter). Before commencement of the work, the Contractor shall submit written evidence that he and all his subcontractors have obtained for the period of the Contract full Comprehensive General Liability Insurance coverage. This coverage shall protect the Contractor; the Owner; the Engineer, its architects and engineers; and each of their officers, agents and employees from claims for damages for bodily or personal injury, sickness or disease, including death, and from claims for damages to property, which may arise directly or indirectly out of, or in connection with the performance of work under this Contract by the Contractor, by any of his subcontractors, or by anyone directly or indirectly employed of either of them, or under the control of either of them, and the minimum amount of such insurance shall be as follows unless higher minimum amounts are otherwise required in the Contract Documents:

Public Liability Insurance in an amount not less than One Million Dollars (\$1,000,000) for damages arising out of bodily or personal injury, sickness or disease, or death of one person and subject to the same limit for each person in an amount not less than One Million Dollars (\$1,000,000) in any one occurrence; and property damage in an amount not less than One Million Dollars (\$1,000,000) for all single combined damages arising out of injury to or destruction of property of others in any one occurrence with an aggregate limit in the same amount.

The Property Damage portion of this coverage shall include explosion, collapse and underground exposure coverage. In addition, where Completed Operation Insurance coverage is applicable, such coverage will be maintained after completion and acceptance of the project for the full guarantee period.

C. Automobile Liability Insurance: Before commencement of the work, the Contractor shall submit written evidence that he and all his subcontractors have obtained Automobile Liability Insurance coverage on all self-propelled vehicles designed for travel on public roads used in connection with the Contract, whether owned, non-owned, or hired. The liability limits shall not be less than Two Hundred Fifty Thousand Dollars (\$250,000) for injury or death of one person and in an amount not less than Five Hundred Thousand Dollars (\$500,000) in any one occurrence; and Property Damage limits of not less than One Hundred Thousand Dollars (\$100,000) in any one occurrence.

D. Contractual Liability Coverage: Each and every policy for Liability Insurance carried by each Contractor and Subcontractor will include a "Contractual Liability Coverage" endorsement sufficiently broad to insure the provision titled "Indemnity" hereinafter set forth.

E. Indemnity: The Contractor shall defend, indemnify and hold harmless the Owner; the Engineer, its Engineers; and each of their officers, agents, servants, and employees; from any and all suits, actions, claims, losses or damage of any character and from all expenses incidental to the defense of such suits, actions or claims, based upon or arising out of or alleged to be based upon or arising out of (1) any injury, disease, sickness or death of any person or persons, (2) any damages to any property including in part loss of use thereof, caused by any act or omission of the Contractor, of any subcontractor of the Contractor, or by their officers, agents, servants, employees, or anyone else under the Contractor's direction and control, and arising out of, occurring in connection with, resulting from, or caused by the performance or failure of performance of any work or services called for by the Contract or from conditions created by the performance or non-performance of said work or services, but not including the sole negligence of any party herein indemnified.

F. Builders' Risk "All-Risk" Insurance: In addition to such Fire and Extended Insurance coverage which the Contractor or his subcontractors elect to carry for their own protection, the Contractor, before commencement of the work, shall effect and maintain for the life of his Contract Builders' Risk "All Risk" completed Value Insurance coverage upon the full insurable value of all portions of the project which is the subject of this Contract and subject to a loss for which Builders' Risk "All-Risk" Insurance coverage gives protection, and shall include completed work and work in progress. This coverage shall be with an insurance company or companies acceptable to the Owner.

Such insurance shall include as Additional Named Insured: The Owner; the Engineer, its architects and engineers; and any of their officers, agents,

and employees; and any other persons with an insurable interest designated by the Owner as an Additional Named Insured.

Duplicate originals of the policy of insurance required herein shall be furnished to the Engineer as provided under "Evidence of Insurance Coverage" hereinafter.

G. Evidence of Liability & Builders' Risk Insurance Coverage: Before commencement of any work, the Contractor shall submit written evidence that he and all his subcontractors have obtained the minimum insurance required by the Contract Documents. Such written evidence shall be in the form of a Certificate of Insurance executed by the Contractor's insurance carrier showing such policies in force for the specified period or by furnishing a copy of the actual policy or policies. Each policy or certificate will bear an endorsement or statement waiving right of cancellation or reduction in coverage without ten (10) days notice in writing to be delivered by registered mail to the Owner.

The Contractor shall furnish duplicate originals of Builders' Risk "All-Risk" Completed Value Insurance coverage to the Engineer, one copy of which shall be for the Owner and one copy for the Engineer.

- SP-6. WATER FOR CONSTRUCTION. The Owner will furnish a fire hydrant meter for construction water on this project. The Contractor will be responsible for paying an \$800 meter deposit before the meter will be set. In addition, the Contractor will be responsible for hiring a licensed plumber to install the backflow prevention device on the fire hydrant meter. The Contractor shall provide for all labor and equipment necessary. Such water shall be taken from the system at times, locations, and under conditions approved by the Engineer. Contractor shall notify Owner at least one week in advance of when construction water will be needed.
- SP-7. ELECTRICITY. The Contractor shall make his own arrangement for electricity.
- SP-8. EXPLOSIVES. The use of explosives will not be permitted.
- SP-9. SANITARY REQUIREMENTS. The operations of the Contractor shall be in full conformance with all of the rules and regulations of boards and bodies having jurisdiction with respect to sanitation. The Contractor shall supply safe and sufficient drinking water to all of his employees, shall obey and enforce all sanitary regulations and orders, and shall take precaution against the spread of infectious diseases. Acceptable, portable, chemical-type toilets shall be provided and maintained by the Contractor.

- SP-10. DISPOSAL OF SURPLUS MATERIALS. All surplus materials not included or incorporated in the project shall be removed from the site to the satisfaction of the Engineer.
- SP-11. SIGNS, BARRICADES, AND LIGHTING. The Contractor shall provide and erect construction signing, barricades and lighting to protect the public in connection with the work, all in accordance with the latest published provisions of the Texas Manual of Uniform Traffic Control Devices and as approved by the Engineer. The construction drawings indicate only the general signing required and do not detail the requirements for protection in connection with trenching and other construction operations.
- Existing street signs, traffic signs and all other signs within the project area shall be protected, maintained and replaced if damaged or stolen; all by the Contractor as approved by the Engineer.
- SP-12. MATERIALS AND WORKMANSHIP. All materials incorporated into this project shall be new and of first quality except as specifically provided for in the technical specifications. The workmanship shall be of the highest level as approved by the Engineer.
- SP-13. EXISTING FACILITIES. Whether shown on the plans or not, the Contractor shall be completely responsible for the protection or replacement of all facilities within the project area and in connection with the work.
- SP-14. GUARANTEE. As a part of this project, the Contractor shall guarantee all materials and workmanship and shall repair or remove and replace any defective condition as determined by the Engineer. Such guarantee shall be effective for a period of one year from the date of written acceptance by the Owner or date of final payment whichever is first. The maintenance bond shall be in full effect throughout the warranty period.
- SP-15. STATE SALES TAX. The Contractor's attention is directed to paragraph No. 3 of Ruling No. 9 by obtaining the necessary permit or permits from the State Comptroller allowing the purchase of materials for incorporation in this project without having to pay the Limited Sales, Excise and Use Tax at the time of purchase. Such bidders must submit segregated prices for the total cost of materials and total cost of services, and the successful bidder must require his sub-contractors to obtain such permits and to sign written sub-contracts in which the prices are segregated for the total cost of materials and the total cost of services. Total materials cost should not include materials which are used or consumed in performing the work, but do not become a part of the completed installation.

After the bid opening and prior to execution of contract, the low bidder will be required to provide a separation of materials costs and labor costs for the

amounts of the base bid and any alternatives. The following form shall be used to provide this information. This form shall be submitted in six(6) copies with the executed contract and such statement will become a part of the contract:

STATEMENT OF MATERIALS AND SERVICES

City of Longview

Project Name: _____

Total Materials Cost: \$ _____

Total Service Cost: \$ _____

TOTAL CONTRACT PRICE: \$ _____

Note: The total materials cost plus the total services cost must equal the amount shown of the total contract price.

SP-16. CLEANUP. The entire project site shall be left in as good or better condition as the condition at the time construction is started, all as approved by the Engineer. All cleanup shall be completed within the time specified for the project construction and liquidated damages will be applied to cleanup time in the event such is performed after the contract time has expired.

SP-17. CERTIFICATE OF INCORPORATION. In the event the contractor is a corporation, the contractor shall furnish a certificate issued by the Secretary of the State of Texas dated not more than thirty days prior to commencement of construction evidencing that the contractor is a corporation duly incorporated under the laws of the State of Texas and currently in good standing, or in the case of a corporation not incorporated under the laws of the State of Texas, the certificate shall evidence that such corporation currently holds a permit to do business in the State of Texas and it is in good standing. Such corporate contractor shall at all times pay all franchise taxes and other taxes and assessments levied against it by the State of Texas and at all times maintain its corporate status and good standing according to the laws of the State of Texas.

SP-18. ALTERNATE MATERIALS AND METHODS. Consistent with the intent and character of this project, the Contractor may request from the Engineer the substitution of materials or methods of construction which he believes will give equal results. The request shall be in writing and shall contain detailed information. The Engineer will consider such requests and shall give his answer in writing. The Engineer's judgement will be final and no reason for denial will be required except as may be offered by the Engineer. The Engineer may require additional information on which to make a judgement; in which case it shall be the entire responsibility of the Contractor to provide such information.

SP-19. EXPECTED EARNINGS SCHEDULE. At the pre-construction conference for this project, the successful bidder shall submit to the City Engineer an "Expected Earnings Schedule". This table or chart shall show the amount of payment the contractor expects to receive from the City on this project each month until the project is completed. The table can be handwritten or typed. Though the contractor shall make his best effort in estimating these payments accurately, the schedule shall be used for estimating purposes only and shall not bind the City nor the Contractor to the listed payments. Payments, as usual, will be made upon actual work performed less the appropriate retainage.

SP-20. PERFORMANCE, PAYMENT, AND MAINTENANCE BONDS. Surplus lines carriers under Article 1.14-2 of the Insurance Code are not eligible to act as sureties on performance, payment, and maintenance bonds.

SP-21. RETAINAGE. Retainage is that part of the contract payment withheld by the City to secure performance of the contract.

Retainage shall be withheld at the following rates:

- A. For any contract where the total contract price estimate at the time of execution of the contract is less than \$400,000 retainage shall be 10%.
- B. For any contract where the total contract price estimate at the time of execution of the contract is greater than or equal to \$400,000 retainage shall be 5%.

SP-22. MATERIAL ON HAND. Unless otherwise specified in a writing signed by the Owner prior to the bid opening for this project, the Owner will pay the Contractor for materials on hand for this project, subject to the provisions of this Contract. Such payment will be made only for materials stored on-site in a manner acceptable to the Owner. At a minimum, materials must be stored in a manner that prevents damage, theft, and vandalism. Additionally, payment will be made only for materials for which the Contractor has supplied invoices to the Engineer that substantiate the amount paid for said materials.

SP-23. INSPECTION. Contractor will be allowed to work prior to 8:00 a.m. and after 4:30 p.m. on weekdays, and may also elect to work on Saturdays. The City will provide an inspector at these times as necessary. The Contractor, however, will be required to reimburse the City of Longview for the actual hours worked by the inspector outside of the regular 8:00 a.m. to 4:30 p.m. Monday through Friday hours. Such reimbursement will be made at a rate of \$25 per hour.

SP-24. AS-BUILT DRAWINGS. The Contractor will provide the City, prior to final payment, one set of construction drawings red-lined to show any changes in actual construction.

- SP-25 FIREARMS PROHIBITED. Contractor agrees that Contractor, Contractor's officers, employees, agents, and representatives, shall not carry any firearms, including without limitation concealed handguns, while in the performance of this Contract and on City premises (including City rights-of-way, utility easements, or drainage easements) or when meeting with City officers or employees regarding this Contract. Contractor agrees that failure by Contractor to comply with this requirement shall constitute a substantial breach of this Contract, entitling City to all remedies under the law or this Contract for such breach, including without limitation the City's right to terminate this Contract for substantial nonperformance.
- SP-26 PREVAILING WAGE RATES. Contractor agrees to abide by the requirements of Texas Government Code Chapter 2258, entitled "Prevailing Wage Rates," as applicable. Contractor understands that a contractor or subcontractor subject to the requirements of that Chapter must pay the prevailing wage rates as set forth in this Contract. Any contractor or subcontractor who violates this requirement may be subject to penalties as provided in Chapter 2258, including but not limited to a penalty of \$60 for each worker employed for each calendar day or part of the day that the work is paid less than the wage rates stipulated in this Contract."
- SP-27 ALLOWANCE FOR MISCELLANEOUS EXTRA WORK: A discretionary allowance has been established in the Bid Proposal for extra work for which a method of payment, such as individual bid items, has not been established. This allowance is not intended to be used to procure payment for items specifically named as subsidiary to other bid items within the contract documents such as the subsurface conditions described in the General Provisions or Special Conditions.

Prior to initiating any item of extra work under the allowance bid item the Owner, Engineer, and Contractor shall agree as to the scope of extra work to be performed and the amount of payment to be made for the particular item of extra work under consideration. Expenditure of the allowance funds is at the sole discretion of the Owner. The allowance may be used in full or in part, as the Owner deems necessary. If no extra work is identified, and approved by the Owner, the allowance funds will not be expended.

Technical Specifications

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SECTION 16050

ELECTRICAL BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

A. Supplementary Conditions

1. The General Conditions and Requirements, Special Provisions are hereby made a part of this section.
2. The Electrical Drawings and Specifications under this division shall be made a part of the contract documents. The drawings and specifications of other divisions of this contract, as well as supplements issued thereto, information to bidders, and other pertinent documents issued by the Owner's Representatives are a part of these drawings and specifications and shall be complied with in every respect. All the above documents will be on file at the office of the Owner's Representative and shall be examined by all bidders. Failure to examine all documents shall not relieve the bidder of any responsibility nor shall it be used as a basis for additional compensation due to omission of details of other divisions from the electrical documents.
3. Furnish all work, labor, tools, superintendence, material, equipment, and operations necessary to provide for a complete and workable electrical system as defined by the contract documents.
4. Contractor shall be responsible for visiting the site and checking the existing conditions. He shall also ascertain the conditions to be met for installing the work and adjust bid accordingly.
5. It is the intent of the contract documents that upon completion of the electrical work, the entire system shall be in a finished workable condition.
6. All work that may be called for in the specifications but not shown on the drawings, or, all work that may be shown on the drawings but not called for in the specifications, shall be performed by the Contractor as if described in both. Should work be required which is not set forth in either document, but which work is nevertheless required for the fulfilling of the intent thereof; then, the Contractor shall perform all such work as fully as if it were specifically set forth in the contract documents.
7. The use of the word "furnish" or "install" or "provide" shall be taken to mean that the item or facility is to be both furnished and installed under this section unless specifically stated to the contrary; that the

item or facility is to be furnished under another section and installed under this section; furnished under this section and installed under another section; or furnished and installed under another section.

8. The use of the term "as (or where) indicated"; "as (or where) shown"; "as (or where) specified"; or "as (or where) scheduled" shall be taken to mean that the reference is made to the contract documents, either under the drawings or the specifications, or both documents.

B. Standards

1. All materials and equipment shall conform to the requirements of the contract documents. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:
 - a. Underwriters Laboratories, Inc. (UL)
 - b. National Electrical Manufacturer's Association (NEMA)
 - c. American National Standards Institute (ANSI)
 - d. Insulated Power Cable Engineers Association (IPCEA)
2. The definition of terms used throughout the contract documents shall be as specified by the following agencies:
 - a. Underwriters Laboratories
 - b. National Electrical Manufacturer's Association
 - c. American National Standards Institute
 - d. Insulated Power Cable Engineers Association
 - e. National Electrical code
 - f. National Fire Protection Association
3. Submit copies of applicable standards with each submittal
4. All material and equipment, of the same class, shall be supplied by the same manufacturer unless specified to the contrary.
5. All materials shall bear UL labels where standards have been set for listing

C. Permits, Codes, and Utilities

1. Secure all permits, licenses, and inspections as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, rules, regulations, and contract requirements bearing on the work.
2. The minimum requirements of the Electrical system installation shall conform to the latest edition of the National Fire Protection Association as well as local and state codes.
3. Codes and ordinances having jurisdiction over the work shall serve as minimum requirements, but, if the contract documents indicate requirements which are in excess of those minimum requirements, then the requirements of the contract documents shall be followed. Should there be any conflicts between the contract documents and codes, or any ordinances having jurisdiction, report these with the bid.
4. All electrical work shall be performed by journeymen electricians and apprentice electricians under the direct supervision of a master electrician, all of which shall be licensed by the State of Texas. A copy of the licenses of the master electrician and journey electricians shall be submitted for review before any work is started.
5. All electrical construction work shall be performed by an electrical contracting firm registered with the State of Texas. A copy of the electrical contracting firm's license shall be submitted for review before any work is started.
6. The Contractor shall notify the serving utilities immediately upon award of the contract. Contact Perry Meeks with Upshur Rural Electric Coop at 903-843-2536.

1.02 SHOP DRAWINGS AND SUBMITTALS

A. Shop Drawings

1. Shop drawings shall be taken to mean detailed drawings with dimensions, schedules, weights, capacities, installation details, and pertinent information that will be needed to describe the Material or equipment in detail.
2. Submittals shall be taken to mean catalog cuts, general descriptive information, catalog numbers, and manufacturer's name.
3. Submit six copies for review of all shop drawings and submittals as hereinafter called for within sixty days after award of contract. If shop drawings and submittals are not received in sixty days, the Owner's representative reserves the right to go directly to the manufacturer for the information and any expense incurred shall be borne by the Contractor.

4. Review of submittals or shop drawings shall not remove the responsibility for furnishing materials or equipment of proper dimensions, quantity and quality, nor will such review remove the responsibility for error in the shop drawings or submittals.
5. Shop drawings and submittals will be returned and unchecked if the specific items proposed are not clearly marked, or if the general contractor's approval stamp is omitted.
6. When requested, furnish samples of materials for acceptance review. If a sample has been reviewed and accepted, the item of material or equipment that is installed on the job shall be equivalent in quality to the sample. If it is found that the installed item is not equivalent, the contractor shall replace all such items with acceptable equivalents.
7. Submit catalog literature for each item of material specified.

B. Operations and Maintenance Manuals

1. Six weeks prior to the completion of the project, compile an operations and maintenance manual on each item of equipment. The manuals shall include detailed instructions on operations and maintenance as well as spare parts lists.
2. Submit six copies for review.

C. Record Drawings

1. During the progression of the project, the contractor shall mark-up blue-line prints with red pencil showing all deviations from the Contract Documents of all raceways, wiring, and equipment installations.
2. The contractor shall transcribe the mark-up information onto sepia prints after work has been completed. The sepia prints shall be labeled "Record Drawings" and shall be delivered to the engineer.
3. Details of control, instrumentation, and signal wiring that are not shown in the Contract Drawings, shall be included with the Record Drawings.
4. Raceway and wiring details of each pullbox and junction box larger than 100 cubic inches shall be included with the Record Drawings. The details shall show the size of each conduit penetration, wire size, wiring function, and terminus information of each raceway and wire.

1.03 QUALITY CONTROL

A. Acceptance and substitutions

1. All manufacturers that are specifically named shall be considered as a basis of standard of quality. Substitutions of any equivalent product will be considered for acceptance unless specifically noted otherwise. The judgment of equivalence of all substitutions shall be made by the Engineer.
2. Requests for substitutions after award of contract shall be made within sixty days after the award of contract. The request shall include all required supporting data. The submittal of substitutions for review shall not be cause for time extensions.
3. Where substitutions are offered, the substituted product shall meet the product performance as set forth in the specified manufacturer's current catalog literature, as well as meeting the details of the contract documents.
4. The details on the drawings and the requirements of the specifications are based on the first listed item of materials or equipment. If any other than the first listed items of materials or equipment is furnished, the contractor shall assume responsibility for the correct function, operation, and accommodation of the substituted item. In the event of misfits or changes in work required, either in this Section or other Sections of the contract, or in both; the Contractor shall bear all costs in connection with all changes arising out of the use of other than the first listed item specified.
5. Energy efficiency of each item of power consuming equipment shall be considered one of the standards for evaluation.

B. Excavation and Backfilling

1. Do all excavating and backfilling necessary for the installation of the work. This shall include shoring and pumping in ditches to keep them dry until the work in question has been installed. All shoring required to protect the excavation and safeguard employees shall be properly performed. See Contract Specification Section TRENCH SAFETY, as applicable.
2. All excavations shall be made to the proper depth, with allowances made for floor slabs, forms, beams, finished grades, etc. Ground under conduits shall be well compacted before conduits are installed.
3. All backfilling of excavations shall be made with selected soil, free of rocks and debris and shall be pneumatically tamped in six inch layers to secure a field density ratio of 90%, unless otherwise specified.
4. All excavated material not suitable and not used in the backfill shall

be removed to the on-site disposal area, as applicable. The on-site area shall be as directed by the Engineer.

5. The contractor shall field check and verify the locations of all existing and proposed underground utilities prior to any excavating. The existing utilities shall remain un-disturbed, as far as possible. In the event existing utilities are broken into or damaged, they shall be repaired so as to make their operation equivalent to what existed before the trenching was started.
6. Where excavation requires the opening of existing walks, drives, or other existing pavement, the cut shall be made as required, to install the proposed utility. The size of the cut shall be held to a minimum, consistent with the work to be installed. After installation of new work is completed and the excavation has been backfilled in accordance with above, repair existing walks, drives, or other existing pavement to match existing installation.

C. Cutting and Patching

1. Cutting and patching required under this section shall be done in a neat workmanlike manner. Cutting lines shall be uniform and smooth.
2. Use concrete saws for large cuts in concrete and use core drills for small round cuts in concrete.
3. Where openings are cut through masonry walls, provide lintel or other structural supports to protect the remaining masonry. Adequate support shall be provided during the cutting operation to prevent damage to the masonry.
4. Where large openings are cut through metal surfaces, attach metal angles around the opening.
5. Patch concrete openings that are to be filled with nonmetallic, non-shrinking grout. Finished concrete patching shall be troweled smooth and shall be uniform with surrounding surfaces.
6. No cutting of structural elements shall be done without permission of the Engineer.

D. Flashing

1. Provide waterproof flashing for each penetration of exterior walls and roofs.
2. Flashing for conduit penetrations through built-up roofs shall be made with pitch panel filled full with pitch.

E. Construction Requirements

1. Except where specifically detailed or shown, the locations and elevations of equipment are approximate and are subject to small revisions as may prove necessary, or desirable, at the time the work is installed. Final locations shall be confirmed with the Engineer in advance of construction. Confirmed locations shall be made for the following:
 - a. Poles
 - b. Receptacles
 - c. Rough-ins and connections for equipment furnished under other sections
 - d. Lighting Fixtures
 - e. Outlets
 - f. Motor Control Centers, Switchboards, Panel boards, etc.
2. Where equipment is being furnished under another section, request from the Engineer an accepted drawing that will show exact dimensions of required locations of connections. Install the required facilities to the exact requirements of the approved drawings.
3. All work shall be done in the best and most workmanlike manner by qualified, careful electricians who are skilled in their trade. The standards of work required throughout shall be of the first class only and electricians whose work is unsatisfactory to the Engineer shall be instantly dismissed from the work upon written notice from the Engineer. All work must meet the approval of the Engineer.
4. Unless shown in detail, the drawings are diagrammatic and do not give exact details as to elevations and routing of conduits, nor do they show all offsets and fittings; nevertheless, install the conduit system to conform to the structural and mechanical conditions of the construction. Unless locations and routing of exposed conduits are shown, confirm locations and routing prior to installation with the Engineer.
5. Holes for raceway penetration into sheet metal cabinets and boxes shall be accurately made with a hole punch. Cutting openings with a torch or other device that produces a jagged, rough cut will not be acceptable.
6. Raceway entry into equipment shall be carefully planned. Cutting of enclosure framework to accommodate poorly planned raceway placement will not be acceptable.
7. Cabling inside equipment shall be carefully routed, trained, and laced. Cables so placed that they obstruct equipment devices shall not be acceptable.
8. Equipment shall be set level and plumb. Supporting devices

installed shall be set and so braced that equipment is held in a rigid, tight fitting manner.

F. Equipment Protection

1. Provide suitable protection for all equipment, work, and property against damage during construction.
2. Assume full responsibility for material and equipment stored at the site and incorporated within the project.
3. Conduit openings shall be closed with caps or plugs during installation. All outlet boxes and cabinets shall be kept free of concrete, plaster, dirt, and debris.
4. Equipment shall be covered and tightly sealed against entrance of dust, dirt, and moisture.
5. All dry transformers prior to energizing shall be protected against moisture and dirt absorption by a suitable covering. Also, maintain heat inside the covering by means of 200 watt minimum lamps.
6. Interiors of switchgear and motor control centers shall be kept clean and dry prior to energizing. Maintain heat inside each unit with one 200 watt lamp located at bottom of each vertical section. Energizing integral condensation heaters shall be acceptable in place of lamps.

G. Cooperation with Work under Other Sections

1. Cooperate with all other trades so as to facilitate the general progress of the work. Allow other trades every reasonable opportunity for the installation of their work and the storage of their materials.
2. The work under this section shall follow the general building construction closely. Set all pipe sleeves, inserts, etc., and see that openings for cases, pipes, etc., are provided before concrete is placed or masonry installed.
3. Work with other trades in determining exact locations of outlets, conduits, fixtures, and pieces of equipment to avoid interference with lines as required to maintain proper installation of other work.
4. Make such progress in work that will not delay the work of other trades. Schedule the work so that completion dates as established by the Engineer are met. Furnish sufficient labor or work overtime to accomplish these requirements if directed to do so.

H. Installation and Connection of Work under another Section

1. Except as otherwise indicated, details of control wiring required for

plant instrumentation are not shown; however, ascertain the requirements and install all wiring as required under those sections.

2. Verify the electrical capacities of all motors and electrical equipment furnished under other sections, or furnished by the Owner, and request wiring information from the Engineer if wiring requirements are different from that specified under this section. Do not make rough-ins until equipment verification has been received.
3. Install all motors, controllers, terminal boxes, pilot devices, and miscellaneous items of electrical equipment that are not integrally mounted with the equipment furnished under other sections. All such equipment shall be securely mounted and adequately supported in a neat workmanlike manner.

I. **Cleanup and Test**

1. Remove all temporary labels, dirt, paint, grease, and stains from all exposed equipment. Upon completion of work, clean equipment and the entire installation so as to present a first class job suitable for occupancy. No loose parts or scraps of equipment shall be left on the premises.
2. Equipment paint scars shall be repaired with paint kits supplied by the equipment manufacturer, or with an approved paint.
3. Clean interiors of each item of electrical equipment. At completion of work, all equipped interiors shall be free from dust, dirt, and debris.
4. Test insulation value of each service entrance cable, each feeder cable, and each branch circuit wire. Test shall be made by means of crank-type ohmmeter that impresses 1500 volts DC across the insulation. Each ungrounded conductor shall have its insulation integrity tested after installation within its raceways from termination-to-termination. However, testing shall be made prior to connection to line and load. All such testing shall be done in the presence of the Owner's Representative and the test results shall be submitted for review. Insulation value of each installed cable and wire shall be equivalent to, or greater than 500,000 ohms. Should the test indicate an insulation value of less than 500,000 ohms, the conductor in question shall be replaced and re-tested. This procedure shall be repeated until the conductor is in compliance.

PART 2 – PRODUCTS

2.01 RACEWAYS

- A. Rigid ferrous metallic conduit shall be hot-dipped galvanized steel, inside and out. Conduit couplings shall be threaded steel with hot-dipped galvanized finish. Such conduit shall be Republic, Triangle, Wheatland, or

equivalent.

- B. Rigid non-metallic conduit shall be Schedule 40 PVC plastic. Couplings shall be PVC solvent-weld type. Such conduit shall be Carlon, or equivalent.
- C. Plastic jacketed rigid metallic conduit shall meet the specifications for conduit above and shall have a 40 mil minimum thickness PVC coating on exterior metallic surfaces. Couplings shall be sleeved. Such conduit shall be OCAL "Blue", or equivalent. Conduit and fitting such as Robroy Plastibond and Perma-cote "Supreme" shall be acceptable.
- D. Flexible liquid tight ferrous metallic conduit shall have extruded thermoplastic cover with interlocked galvanized steel core. The conduit shall be U. L. listed. Such conduit shall be Anaconda, Republic, Electri-flex, or equivalent.
- E. Flexible liquid tight non-metallic conduit shall consist of a PVC spiral encased in a flexible PVC jacket. Such conduit installations shall include non-metallic liquid tight fittings. The conduit shall be Carlon Carflex or equivalent.
- F. Rigid metallic conduit locknuts shall be galvanized steel in sizes under 2" and galvanized malleable iron on sizes 2 1/2" and larger. Sealing locknuts shall have in addition to that specified above, an integrally fused thermoplastic gasket so that the locknut is rated NEMA-4.
- G. Rigid metallic conduit insulating bushings shall be molded canvas bakelite type suitable for operation in 100 degrees C rise over 40 degrees C ambient. Polypropylene bushings shall not be acceptable.
- H. Grounding type bushings shall have threaded steel body, insulated throat, and ground lug. Insulated throat shall meet specifications under Article G above.
- I. Rigid metallic conduit expansion/deflection fittings shall be water-tight with flexible plastic sleeve that allows 3/4" movements in all directions. Hubs shall be threaded, hot dipped galvanized (HDG) malleable iron. Clamping bands shall be stainless steel. There shall be an equipment ground bonding jumper. Expansion deflection fittings shall be Crouse Hinds, OZ, or equivalent.
- J. Rigid metallic conduit hubs shall be liquid-tight type with threaded HDG malleable iron female body, with sealing ring on conduit side and threaded male tapered steel body with hardened steel locknut on box side. Plastic jacketed hubs shall have 40 mils PVC coating. Such fittings shall be T&B, Crouse Hinds, or equivalent.
- K. Chase nipples, reducers, enlargers, "Ericksons", capped els, short els, long els, split couplings and fittings shall be HDG malleable iron threaded type for use with rigid metallic conduit.

- L. Rigid metallic conduit bodies shall be HDG malleable iron type with threaded hubs, gasketed cast metal covers with stainless steel screws. All such conduit bodies shall be Crouse-Hinds, or equivalent.
- M. Liquid-tight flexible conduit fittings, 2" and larger, shall consist of HDG steel body with captive grounding ferrule and sealing ring, and compression nut. Connector body shall have nylon insulated throat. Pull-out resistance of each completed connector shall be at least 1 1/2 times U. L. minimum. Such fittings shall be T&B, Crouse-Hinds, Appleton, or equivalent. Liquid-tight flexible conduit fittings, smaller than 2", shall be non-metallic.
- N. Rigid metallic conduit boxes shall be HDG cast iron, with threaded integrally-cast hubs, cast metal cover, and stainless steel cover screws. Such boxes shall be Crouse-Hinds, Appleton, or equivalent. Plastic jacketed type shall have 40 mils minimum coating of PVC.
- O. Cadmium and electro-galvanized plated devices and hardware shall not be acceptable.

2.02 WIRE & WIRING DEVICES

A. WIRE

- 1. All conductors for power and control wiring shall be stranded, soft drawn copper.
- 2. Insulation for Power and Control Circuitry shall be 75°C rated THHN/THWN-2 for all installations in conduits, except as specifically noted otherwise.
- 3. Factory pigmented insulation color for sizes #6 and smaller for power wiring shall be as follows:

- a. 150V-to ground, or less:

<u>Phase</u>	<u>Color</u>
A	Red
B	Black
C	Blue
Grounding Conductor	Green
Grounded Conductor	White

- b. Greater than 150V-to-Ground:

<u>Phase</u>	<u>Color</u>
A	Brown
B	Purple

C	Yellow
Grounding Conductor	Green
Grounded Conductor	Gray

4. Bare conductors for grounding purposes shall be hard-drawn stranded copper.
5. Instrumentation hook-up wire (TPS)---shall be 600V., U. L. rated #16 AWG tinned stranded (19x29) copper with 32 mil polyethylene insulated, twisted pair or triad with aluminum-polyester shield and #18 AWG stranded tinned copper drain wire and a 32 mil chrome vinyl jacket. The wire shall be Belden 8719 for 2/C and Belden 8618 for 3/C or equivalent by Dekeron. Other types shall be as noted on the contract drawings.

B. Connectors

1. Mechanical connectors shall be bolted pressure type with tin-plated bronze body and tin-plated silicon-bronze hardware.
2. Insulated spring wire connectors shall be plated spring steel with thermoplastic jacket. Connectors shall be rated at 105° C continuous. Such connectors shall be Ideal, T&B, or equivalent.
3. Insulated set-screw connectors shall consist of copper body with flame-retardant, 600V. Class insulated shell. Such connectors shall be Ideal, T&B, or equivalent.
4. Terminal connectors for flat-head terminal screws shall be locking spade type with vinyl insulated, compression indent shaft, T&B, Ideal, Amp, or equivalent.
5. Terminal strips shall be channel-mounted type with tin-plated solderless box lugs contained with barriered nylon-insulated separable barriers. Such devices shall be Square D, Cutler-Hammer, Allen Bradley, or equivalent.

C. Insulating Products

1. General purpose electrical tape shall be 7 mil thick stretchable vinyl plastic, pressure-adhesive type; Plymouth "Slipknot Grey", 3M "Scotch #33, or equivalent.
2. Insulation putty shall be rubber-based, non-vulcanizing, elastic-type putty in tape form; Plymouth #2074, 3M "Scotchfill", or equivalent.
3. High Temperature, insulating void filling, moisture-proof tape shall be stretchable ethylene propylene rubber with high-tack, self-fusing surfaces. Tape shall be rated for 90 degree Centigrade continuous, 130 degree Centigrade overload. Such tape shall be Plymouth "Plysafe", 3M Scotch 23", or equivalent.

D. Labels, Nameplates, and Signs

1. Marking labels for wire numbering shall be type-on heat shrink plastic. Such labels shall be Raychem "Shrinkmark", or equivalent.
2. Write-on labels for conduit identification shall be weather resistant polyester with flat surface for marking pen application of usage.
3. Colored bonding tape shall be 5 mil stretchable vinyl, self-adhesive, and with permanent solid colors corresponding to here in before specified wire colors; Plymouth "Slipknot 45", 3M "Scotch 35", or equivalent.
4. Three layer laminated nameplates shall be 3/32" inch thick, lengths as required to accommodate lettering, and in 3/4" and 1 1/4" widths. Each plate shall have adhesive backing with pull-apart resistance of at least 100 PSI. Plates shall be laminated type with black background and white letters.
5. Signs shall be similar to nameplates in 4. above with the size, type, and wording as indicated on the contract drawings.

E. Supporting Devices

1. Slotted channel supports and framing members shall be cold rolled steel. Finish for all locations shall be hot dipped galvanized after fabrication. Size of slotted channels unless otherwise indicated, shall be 1-5/8"W x 1-5/8"D in cross-section. Furnish Unistrut P-1000 or equivalent. Also furnish stainless steel or aluminum channel, as noted on the contract drawings.
2. Beam clamps, side-beam connectors, and one-hole clamps shall be hot dipped galvanized malleable iron, and shall be Steel City, T&B, or Gedney. Plastic coated types shall have 40 mils, minimum PVC covering.
3. Pressed steel, two-piece single bolt, slotted channel conduit straps shall be stainless steel and shall be of the same manufacturer as the slotted channel. Plastic coated types shall have 40 mils, minimum PVC covering and hardware shall be stainless steel.
4. Slotted channel hardware (nuts, bolts, washers, etc.) shall have hot stainless steel finish.
5. Concrete and masonry anchors shall be stainless steel type equivalent to Hilti brand.

F. Wiring Devices

1. All wiring devices shall be specification grade, ArrowHart, Hubbell,

or equivalent.

2. Two-pole, 3-wire grounding 20A/125V, NEMA 5-20R duplex receptacle shall be AH #5362, Hubbell #5362, or equivalent.
3. GFCI device shall be a duplex 5-20R, 20 A, 125 VAC, 3-wire outlet with reset and test pushbuttons P&S #2091, or equivalent. Dry location enclosure shall consist of nylon coverplate. Wet location enclosure shall consist of stainless steel coverplate P&S #4516 on an FD box.
4. Single-pole, single-throw, 20A toggle switch shall be AH #1991, Hubbell #1223, or equivalent.
5. Single-pole, double throw (three way) 20A Toggle switch shall be AH #1993, Hubbell #1223, or equivalent.
6. Double-pole, double throw 20A toggle switch shall be AH #1994, Hubbell #1224, or equivalent.
7. Manual motor controller shall be Allen Bradley Bulletin 600, Square D Class 2510, or equivalent. Select overloads to be 1.15 times motor FLA.
8. Covers for wiring devices located out-of-doors, and in damp or wet locations shall have stainless steel weather proof cover, gaskets, and stainless steel cover screws.

2.03 DISTRIBUTION EQUIPMENT

A. Safety Switches

1. Safety switches shall be size and type as indicated. Each disconnect means shall be heavy-duty, quick-make, quick-break mechanisms.
2. Unless otherwise indicated, safety switches shall be in a NEMA 4X stainless steel enclosure.

B. Fuses

1. Fuses shall be furnished for each fused over-current device and, in addition, furnish three spare fuses for each rating required shall be furnished.
2. Fuses above 600 ampere shall be constructed using silver links with a fusing alloy soldered to the link for low temperature overload protection. The design shall provide time-delay of not less than 45 seconds at 300% of ampere rating. The interrupting rating shall be

at least 200,000 amperes RMS symmetrical.

3. Fuses rated 600 amperes or less shall be dual element Class R, time-delay type. Such fuses shall incorporate separate thermal overload and short circuit elements. The design shall provide time delay of not less than ten seconds at 500% of ampere rating. The interrupting rating shall be 200,000 amperes RMS symmetrical.
4. Fuses shall be Bussman, Chase-Shewmut, or equivalent.

C. Panel boards

1. Panel boards shall be dead-front type and shall be manufactured in accordance with Underwriters' Laboratories, Inc., standard for Panel boards (UL67). Residential load centers shall not be acceptable in lieu of panel boards.
2. The panel boards shall include automatic short circuit and over-current protective devices of the molded case circuit breaker type. All multi-pole breakers shall be so designed that an overload on one pole automatically causes all poles of the circuit breaker to open. The circuit breakers shall be quick-make, and quick-break on manual as well as automatic operation and shall have inverse time trips. Circuit breakers shall have the short circuit interrupting ratings indicated on the drawings.
3. Interiors shall be assembled on reinforced mounting pans or rails which provide protection against damage during handling or installation. Circuit breakers shall be assembled in accordance with the panel schedules included on the drawings. Design shall permit replacement of individual breakers without disturbing adjacent units or without disturbing main bus or branch circuit connectors. Interior design shall permit changing of branch circuits or the addition of circuit breakers to future spaces without additional machining, drilling, or tapping. Main bus bars and branch circuit connectors shall be made of copper. In-and-out adjustments of the panel interior shall be provided.
4. Panel bussing shall be arranged to maintain sequence phasing throughout, that is, adjacent poles shall be of unlike polarity and rotated in sequence. Circuit members shall be provided for each pole space or breaker space as shown on the panel schedule.
5. Cabinets shall be manufactured in accordance with Underwriters' Laboratories, Inc., standard for Cabinets and Boxes (UL 50) and shall provide a minimum of four inches wiring gutter on all sides. Cabinet fronts shall include doors with semi-concealed hinges, combination lock-and-catch on doors, and a directory frame with circuit directory behind clear plastic, mounted on back of door. The front shall be attached to the box with suitable provision to provide proper alignment of trims.

2.04 MISCELLANEOUS

A. Grounding Devices

1. Ground rods shall be copper clad steel in lengths and diameters as indicated.
2. Ground rod connectors shall be copper alloy with silicon bronze bolts and in sizes to fit ground rod diameters. Furnish OZ, Burndy, or equivalent.
3. Pipe ground connectors shall be copper alloy with silicon bronze bolts and in sizes to fit pipe diameter. Furnish OZ, Burndy, or equivalent.
4. Thermal welding devices shall consist of correct size molds to fit application and correct amount of weld metal. Furnish Enrico "Cadweld", Burndy "Thermoweld", or equivalent.

2.05 MEDIUM VOLTAGE MOTOR STARTERS

A. General

1. This specification covers motor controllers for control and protection of 4,160 volt, 3 phase, 60 Hz, induction motors up to 1,000 HP.

B. References

1. Controllers shall be designed, manufactured, assembled, and tested in accordance with the following standards:

NEMA ICS 2-324

UL 347

CSA 22.2, #0 and #14

ANSI C19.7

C. Manufacturers

1. The controllers shall be Eaton (Cutler Hammer), WEG, or engineer accepted equivalent.

D. Construction

1. Basic structure for NEMA-1 gasketed enclosures shall consist of formed and bolted back and side plates and shall be minimum 12 gauge sheet metal. All doors shall be minimum 12 gauge sheet metal, pan type with flanges formed to provide sturdy, rigid structure.

2. Compartment door latches and hinges shall be capable of holding door closed during maximum fault condition. Ventilation openings shall be provided where required.
- E. Enclosures shall be gasketed free standing NEMA-1 rated. All metal parts shall be given a thorough rust resistant treatment and painted with one coat of ANSI-49 medium grey baked enamel.
- F. Each indoor type vertical section shall have maximum dimensions of 100" high, 130" wide, and 44" deep.
- G. Controllers in individual section shall have three distinct, isolated compartments as follows:
1. Line terminations, power bus, and isolation switch compartment shall be at middle rear portion of each vertical section.
 2. Medium voltage compartment shall include mechanical and electrical interlocks to minimize electrical hazards. The compartment shall have hinged door to permit easy access to medium voltage equipment such as fuses, current and potential transformers, and contactors.
 3. Low voltage control compartment shall be located in upper half of vertical section with hinged door to permit easy access to meters, relays, pilot devices, and terminal strips for inspection and maintenance.
 4. Ground bus, when required, shall be continuous, and extend from one end of motor controller line-up to the other through each vertical section. Bus shall be located in bottom front of each vertical section.
 5. All bus ratings shall be in accordance with UL Standard 347.
 6. All bus bars shall be tin-plated copper.
 7. All bus bars and cables shall be braced to withstand, without damage or deformation, maximum let through current permitted by current limiting fuses.
 8. All bolted power bus joints shall have minimum of two bolts. To facilitate future extension of motor controller line-up on either side, horizontal bus and ground bus shall be provided with suitable bolt holes.

H. Design shall provide complete front accessibility to all electrical parts when installed against walls or for back-to-back arrangements.

I. Wiring

1. Controllers shall be complete with all internal power and control wires including terminations for external connections. Phase sequencing shall have proper identification and all wires shall have suitable markings at all terminations. All control wiring shall be numbered at all terminations.
2. Incoming line shall be connected to incoming line terminations located in isolated area at left rear of vertical section. Space shall be provided for terminating a maximum of (1)-#3/0 AWG cables per phase with either top or bottom entry as specified by user.
3. Motor cables requiring stress cones shall be connected to load connection box on left side wall. Space shall be provided for terminating a maximum of (1) - #3/0 AWG cable per phase for top or bottom entry.
4. Space shall be provided for stress cones for incoming line and load cables on all types of construction.

J. Controller

1. Controllers shall be Reduced Voltage Solid State (RVSS) as indicated on the contract drawings.
2. Controllers shall be 3-pole, designed for long operating life in contaminated atmosphere, and shall have interrupting rating of 7,300 Amperes.
3. Low Voltage connections to controller shall be made with quick disconnect plug.
4. Design shall have cable terminations easily accessible to disconnect cables.
5. Controller shall include auxiliary contacts rated at 10 amperes continuous. Maximum of eight contacts (N.O. or N.C.) shall be provided on contactor as indicated on the contract drawings.
6. RVSS controllers shall include "soft-start" and "soft-stop" functions with adjustable ramp times.

K. Power Fuses

1. Power fuses shall be integral part of medium voltage compartment and shall be vertically mounted and front accessible for ease of inspection and removal without special tools. Power fuses shall be current limiting type with three phase symmetrical interrupting ratings of 200 MVA at maximum of 5,000 volts, and shall have blown-fuse indication.

L. Control Power Transformer

1. Control transformer with 120 volt secondary and primary current limiting fuses shall be mounted separately in vertical section, and shall be rated at minimum of 500VA.

M. Power Circuit Isolation Means

1. Externally operable, gang operated, non-load break medium voltage isolation switch with quick make quick break action shall be included for each controller. It shall be capable of closing and interrupting no load current of control transformer supplied with controller. The switch shall have viewing window to verify blade position.
2. Isolation switch shall be vertically operated by external handle operating through approximately 180° arc to accomplish the following:
 - a. Isolate medium voltage contactor and power fuses from power supply.
 - b. Disconnect primary of control transformer.
 - c. Release door interlock so that medium voltage door can be opened.
3. Isolation switch handle shall be rugged, simple and shall have provision for padlocking in open position.
4. Provide line isolation vacuum contactor.
5. Provide fully rated bypass vacuum contactor for each RVSS.

N. Interlocking

1. Mechanical interlocking shall be designed to prevent the following:

- a. Opening isolation switch when controller is closed.
 - b. Opening medium voltage compartment door with isolation switch handle in "ON" position and isolation switch closed.
 - c. Closing isolation switch with door open.
 - d. Closing isolation switch with controller placed in its normal operating position and closed while testing controller operation.
2. Electrical interlocking shall be provided so the controller operating coil is de-energized, before the isolation switch can be opened.

O. Control

1. Control power shall be 120 volt AC from a 500 VA control transformer mounted separately in the vertical section.
2. Control transformer shall be fused on primary and secondary for proper coordination. Two fuses shall be supplied on primary and one fuse on secondary side with one leg grounded. Primary of control transformer shall be disconnected from power supply with isolation switch in open position.
3. Control wires shall be a minimum size of #14 AWG stranded and rated for 600 volts. All control wires shall be identified at all termination points with numbers.
4. Terminal blocks shall be rated for 600 volts and be suitable for terminating a maximum size of #10 AWG wire. Both ends of control wires shall be marked with numbers for identification.
5. Push buttons, pilot lights, and control relays shall be rated for 600 volts. All pilot lights shall be push-to-test transformer type.
6. Controller shall include circuit to test controller and control circuit when isolation switch is in open position. Test circuit shall consist of receptacle and plug mounted in medium voltage compartment and accessible only when medium voltage compartment door is open. In test position, plug may be removed from receptacle and connected to an external 120 volt source of power. This shall isolate control transformer and prevent energizing control transformer secondary from test voltage source.

7. All devices mounted in low voltage compartment shall be suitably identified.
- P. Motor Protection Relay - Where indicated on the contract drawings, provide a definite purpose microprocessor based motor protective relay in each starter and/or where indicated on the drawings for protection, control, monitoring of the motors. The relay shall be an Eaton IQ-260 series, or equivalent by WEG. The relay shall meet UL 991 and 508 standards and be C.S.A. certified and include the following features:
1. Protective Functions: The true R.M.S. current into the motor shall be constantly monitored, and by means of a protective algorithm separated into positive and negative sequence components. These components shall be used to determine the heating effects on the stator and rotor of the motor to provide maximum motor protection and utilization. The relay shall be capable of being connected by three wire conductor to an integral resistance temperature detection (RTD) module located in the starter to monitor up to six (6) motor winding and two (2) bearing RTD inputs. The RTD's shall be 100 ohm platinum. The protective relay shall integrate the temperature input data from the RTD with the protective algorithm. The relay shall provide the following protective functions:
 - a. Motor running time over-current protection (IEEE Device 49/51)
 - b. Adjustable instantaneous over-current protection (IEEE Device 50)
 - c. Current Unbalance protection (IEEE Device 46)
 - d. Rotor protection
 - e. Under-load trip with start and run time delays (IEEE Device 37)
 - f. Jam trip with start and run time delays
 - g. Winding (stator) protection with (6) RTD's (IEEE Device 49)
 - h. Motor bearing over-temperature protection with (2) RTD's (IEEE Device 38).
 - i. Resistance Temperature Detector (RTD) Monitor---Each starter shall include a monitor to accommodate the inputs

from eight 100 ohm platinum RTD's located in each pump motor. The pump motor bearing and winding RTD's are existing. The monitor shall display the temperatures in °F/°C and shall provide for operator setting of alarm and trip temperature setpoints. Multiple alarm and trip outputs shall be available for remote indication and shutdown. The trip setpoint shall be wired to shutdown the starter.

2. Control Functions: The following control functions shall be provided by internal microprocessor based timers or relays:
 - a. Incomplete sequence delay (IEEE Device 2/19)
 - b. Limitation on number of starts per time period (IEEE Device 66)
 - c. Anti-backspin time delay (IEEE 2)
3. Monitoring Functions: The relay shall include a digital display of the following monitoring functions displayed in true RMS:
 - a. Line amperes in each phase
 - b. Percent Motor Full Load Current in each phase
 - c. Cumulative running time in hours
 - d. Total number of starts and number of starts remaining per hour
 - e. Time left since oldest start in minutes
 - f. Winding temperature in degrees C
 - g. Motor bearing temperature in degrees C
4. Inputs: The relay shall be capable of accommodating external current transformers with ranges from 10/5 through 4000/5 amperes. Provide three (3) current transformers sized per manufacturers recommendations based on motor full load amperes and service factor. Unit shall include terminals for shut down based on external contacts for incomplete sequence of operation and remote trip/remote reset. The unit shall draw its power from a control power transformer located in the starter.
5. Outputs: The device shall have separate Form C (NO/NC) Trip, Bell, and Alarm contacts with ratings of 10 amperes at 115/240 volt AC or 30 volt DC resistive. The device shall include one Form C contact to be used as a transition relay in reduced voltage or multi-speed starter applications.
6. Operating and Construction Features: The relay shall be capable of monitoring electrical current; receiving commands from remote sources either by contact closures or digital data; giving commands

by means of contact closure to the motor starters and other devices under its control; and displaying information by alphanumeric display to the operator and by digital signals with other equipment. The combination relay and operator panel shall be mounted on the door of the starter. Specific data entry to suit the actual motor application shall be programmed into the device by means of the operator panel pushbuttons. Entered data shall be stored in non-volatile memory so as not to require battery back-up. Non-volatile memory shall be capable of storing all set-up information even after power failure, all monitored information at the time of a trip, and cause of trip even after power failure. All programmed set-points shall be secured by means of a switch and key. Alphanumeric display shall read out (in English) complete description of all protective functions e.g., "instantaneous over-current" and all monitored and programmable data such as "percent of full load in amps" and "motor bearing temperature."

Q. Fuses

1. Fuses shall be furnished for each fused over-current device (power and control) and, in addition, three spare fuses for each rating required shall be furnished as spares.
2. A floor or wall mounted steel cabinet shall be furnished to house the spare fuses

R. Reduced Voltage Solid State (RVSS) Modules

1. RVSS modules shall be furnished where indicated on the contract drawings and shall generally comply with section 2.06 below.

S. Miscellaneous

1. Servicing shall be possible with controller inside the enclosure; however, the controller shall be capable of being removed.

Nameplates

1. Suitable nameplates shall be included on controller and controller door identifying manufacturer's factory order, and wiring diagram numbers.
2. Unit identification plates shall be 5 1/2" X 1 1/2" with 3/8" black letters on white background.

T. Testing

1. Each starter shall undergo standard manufacturing testing. Each starter shall be factory load tested with an induction motor on a dynamometer or equivalent test stand for a minimum of four (4) hours at rated load with system voltage applied.

U. Commissioning

1. The starter manufacturer shall provide the services of a factory engineer for the start-up of the equipment after it is installed according to the manufacturer's recommendations. Functional testing, commissioning, and first parameter adjusting shall be carried out by the factory engineer. Testing, final parameter adjustments, and performance tests shall be carried out by the factory engineer with the customer present.
2. One (1) eight-hour man-day of commissioning shall be included in the bid. After commissioning has been completed, the factory engineer shall review the customers operating procedures and provide an additional day of basic hands-on maintenance and operation training to the customer's personnel. The operator training shall be scheduled in writing, at the customer's convenience, after start-up and check-out has been completed.

2.06 MEDIUM VOLTAGE REDUCED VOLTAGE SOLID-STATE STARTER

A. Each Starter shall include the following equipment:

1. Medium Voltage Sections:
 - a. (1) fixed portion isolating switch with shutter mechanism
 - b. (1) removable portion isolating switch with blown fuse indication (where applicable).
 - b. (3) clip-in Current-limiting power fuses
 - c. (1) stab-in main vacuum contactor assembly
 - d. (1) roll-out three-phase solid-state power stack assembly (herein after specified)
 - e. (1) control circuit transformer 2 KVA
 - f. (2) control circuit primary fuses
 - g. (1) control circuit secondary fuse
 - h. (1) run test circuit
 - i. (4) electrical interlocks
 - j. (1) zero sequence ground fault current transformer where ground fault protection is specified.
2. Low Voltage Section:
 - a. (1) motor protection relay

- b. (1) set of control relays
 - c. (1) set of control circuit terminal blocks
 - d. (2) PT's, Open Delta
 - e. (1) Isolation switch viewing window to verify switch position
 - f. (1) set of control terminal blocks
 - g. (1) solid-state reduced-voltage control compartment.
3. The solid-state reduced-voltage controller shall be an Eaton MV4S or WEG SSW-7000C. The starter shall be UL and CSA listed. The power section may be thyristor based and if so, shall be rated as follows:
- a. Soft Starter shall operate with input voltage variation of -60% to +10% and frequency variation of +/-10%.
 - b. Thyristors used within power modules shall be rated for 6.5kV with peak reverse voltage on the power stack of 13kV for 4.16V operation.
 - c. Thyristor power modules shall have hardware protection via active dv/dt filter.
 - d. Thyristor power modules and MV fuse assembly combination shall be rated for minimum 400% of motor rated current for 20 seconds to achieve minimum two starts per hour without affecting thermal stability of either component.
 - e. Soft Starter bus at 4.16kV operation shall withstand 40kA short circuit current for 10mS with fuses clearing the fault.
 - d. Soft Starter assembly shall have insulation voltage level of 12.5kV for 4.16kV operation (power frequency withstand for 60s) and BIL of 60kV for 4.16kV operation.
- B. The control boards shall be mounted for ease of testing, service and replacement. They shall be located in an easily accessible low voltage compartment in the front of the soft start compartment. The logic board shall be identical for all ampere ratings and voltage classes.
- C. The fully rated integral bypass vacuum contactor shall energize when the motor reaches 90% of full speed.
- D. For 400 amp frame size and below, the solid-state power stack assembly shall be mounted on a roll-out truck for ease of maintenance. When the truck is removed, the load cables shall be easily moved to the line side stabs to allow full voltage starting in emergency situations.
- E. A fully rated integral bypass vacuum contactor shall energize when the motor reaches 90% of full speed.

- F. For 400 amp frame size and below, the solid-state power stack assembly shall be mounted on a roll-out truck for ease of maintenance. When the truck is removed, the load cables shall be easily moved to the line side stabs to allow full voltage starting in emergency situations.
- G. Ramp features shall be programmable via the operator interface or a laptop computer and shall include:
 - 1. Dual ramp adjustments with current limit to 600% FLA
 - 2. Adjustable Kick Start Time, 0.1 to 2 seconds
 - 3. Adjustable Kick Start Voltage, 0 – 100%
 - 4. Adjustable Ramp Start Time, 1 – 120 seconds
 - 5. Pump deceleration with begin and end torque adjustments, 1 – 60 seconds.
- H. All solid state reduced voltage starters shall be rated for 500% overload for 60 seconds.
- I. The existing Raw Water Pump motors are as follows:

Westinghouse TECO, Type AMRK-EC002, Frame 450M, WP1
4,160 Volt, 3-phase, 60 HZ, Design B, 106 Amp, 1182 RPM,
Insulation Class F, 40 Degree C Ambient, 1.15 S. F, NEC Code F

2.07 MEDIUM VOLTAGE SHIELDED POWER CABLES

- A. 5 KV shielded power cable
 - 1. All medium voltage cable shall be 5 KV shielded power cable consisting of uncoated class B stranded copper conductor with extruded semi-conducting strand screen, 125/140 mils of ethylene-propylene rubber thermosetting compound insulation, and 80/110 mil overall PVC jacket.
 - 2. The conductor stranding shall meet ASTM B-8.
 - 3. The strand screen and insulation shall meet electrical and physical requirements of ICEA S-68-516, AEIC CS6, and UL 1072.
 - 4. The cable shall be UL listed as Type MV-115 in accordance with UL 1072. The cable shall be Okonite Okoseal Type MV-115 or approved equivalent.

2.08 MEDIUM VOLTAGE POTENTIAL TESTING:

- A. Test insulation value of each 5 KV medium voltage cable. Tests shall be made by means of a high potential DC voltage test set that shall impose the DC potential across the cable insulation. Each ungrounded conductor shall have its insulation integrity tested after installation within its raceways from termination-to-termination including installed terminations (potheads,

stress cones, etc.). However, testing shall be made prior to connection to line and load. All such testing shall be done in the presence of the Owner's Representative and the test results shall be submitted for review. The leakage current of each installed cable shall be recorded during the test and submitted for review. The tests shall be performed by a third party Professional Electrical Engineer registered in the state of Texas.

2.09 SHORT CIRCUIT, PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS, & ARC-FLASH STUDY:

- A. A short circuit, time-current coordination, and arc-flash study for the proposed modifications to the existing medium voltage distribution system at the pump station shall be performed and submitted for review. The time-current coordination and arc-flash analysis shall be performed with the aid of a digital computer and shall include the determination of settings, ratings, or types for the over-current protective devices supplied.
- B. Where necessary, an appropriate compromise shall be made between system protection and service continuity with system protection and service continuity considered to be of equivalent importance.
- C. A sufficient number of computer generated log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected over-current devices and other pertinent system parameters.
- D. Computer printouts shall accompany the log-log plots and shall contain descriptions for each of the devices shown, settings of the adjustable devices, the short-circuit current availability at the device location when known, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
- E. The study shall include a separate, tabular computer printout containing the suggested device settings of all adjustable over-current protective devices, the equipment where the device is located, the device number corresponding to the device on the system one-line diagram, and the number of the time-current log-log graphs where they are illustrated.
- F. A computer generated system one line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers, and the maximum available short circuit current at each bus when known.
- G. A discussion section which evaluates the degree of system protection and service continuity with over-current devices, along with recommendations as required for increasing system protection or device coordination. This section shall include a simple statement in laymen's terms addressing any

problems that may exist and suggestions for their remedy.

- H. Bound copies of the completed protective device time-current coordination analysis shall be submitted for review.
- I. The supplier shall set all devices in the field according to the analysis during the commissioning of the equipment.
- J. The arc-flash study shall be in accordance with the applicable NEMA, ANSI, IEEE, and OSHA standards. The study shall include the level of arc-flash hazard for each item of electrical equipment and the appropriate level of personal protective equipment required per OSHA standards. The contractor shall provide required arc-flash hazard warning signs for delivery to the owner for posting by the owner.
 - 1. A time-current coordination and arc-flash study for the medium voltage distribution system at the pump station shall be performed and submitted for review. The time-current coordination and arc-flash analysis shall be performed with the aid of a digital computer and shall include the determination of settings, ratings, or types for the over-current protective devices supplied.
 - 2. Where necessary, an appropriate compromise shall be made between system protection and service continuity with system protection and service continuity considered to be of equivalent importance.
 - 3. A sufficient number of computer generated log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected over-current devices and other pertinent system parameters.
 - 4. Computer printouts shall accompany the log-log plots and shall contain descriptions for each of the devices shown, settings of the adjustable devices, the short-circuit current availability at the device location when known, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
 - 5. The study shall include a separate, tabular computer printout containing the suggested device settings of all adjustable over-current protective devices, the equipment where the device is located, the device number corresponding to the device on the system one-line diagram, and the number of the time-current log-log graphs where they are illustrated.

6. A computer generated system one line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers, and the maximum available short circuit current at each bus when known.
7. A discussion section which evaluates the degree of system protection and service continuity with over-current devices, along with recommendations as required for increasing system protection or device coordination. This section shall include a simple statement in laymen's terms addressing any problems that may exist and suggestions for their remedy.
8. Bound copies of the completed protective device time-current coordination analysis shall be submitted for review.
9. The supplier shall set all devices in the field according to the analysis during the commissioning of the equipment.
10. The arc-flash study shall be in accordance with the applicable NEMA, ANSI, IEEE, and OSHA standards. The study shall be include the level of arc-flash hazard for each item of electrical equipment and the appropriate level of personal protective equipment required per OSHA standards. The contractor shall provide required arc-flash hazard warning signs for delivery to the owner for posting by the owner.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Basic Materials and Methods

1. Install the conduit system to provide the facility with the utmost degree of reliability and maintenance free operation. Kinked conduit, conduit inadequately supported or carelessly installed shall not be accepted.
2. Raceways shall be installed for all wiring runs except as otherwise indicated.
3. Conduit sizes, where not indicated, shall be code-sized to accommodate the number and diameter of wires to be pulled into the conduit. Use NEC tables for sizing.
4. Exposed runs of conduit shall be installed parallel to the lines of the structure.
5. All above grade conduit and fittings (except as specifically noted

otherwise) shall consist of hot dipped galvanized steel conduit and fittings. Underground conduits shall be direct buried schedule 40 PVC plastic. All conduit runs for low voltage signal wiring shall consist of 40 mil PVC coated rigid steel and fittings. See "Typical Conduit Detail" on the contract drawings.

6. PVC runs shall be joined with manufacturer's approved cement.
7. Finished installation of conduit runs from each terminus to each terminus shall be watertight.
8. Generally, raceways shall be installed exposed in the buildings and structures, except as otherwise specified. Horizontal runs shall be supported on 24" centers and vertical runs on 48" centers.
9. Yard runs of conduit shall be direct buried schedule 40 PVC plastic. The transition from underground horizontal to above grade shall consist of schedule 40 mil PVC coated steel conduit and fittings to 6" above grade, at all up-turns to structures and equipment. The up-turn shall be made with a 40 mil PVC coated steel 90 degree elbow and conduit. Depth of lateral runs shall be 24" minimum and 36" maximum, unless otherwise indicated. Coordinate installation with site work finished grades. See "Typical Conduit Detail" on the contract drawings.
10. Conduit bodies such as "LB, "T", Condulets, Unilets, or equivalent shall be installed in exposed runs of conduit wherever required to overcome obstructions, and to provide pulling access to wiring. Covers for such fittings shall be accessible and unobstructed by the adjacent construction. The use of wireways and junction boxes shall be held to a minimum. The use of wireways and junction boxes shall be coordinated with the engineer before installation.
11. Conduit shall enter all wireways, boxes, motor control centers, panel boards and other enclosures straight and true. Conduits installed cocked and not parallel to the lines of the enclosure shall not be acceptable.
12. Plastic jacketed flexible metallic (2" and larger) or non-metallic conduit (below 2") shall be used for connections to motors, electric valve operators, HVAC equipment, motorized louvers, lay-in lighting fixtures, and other devices that may need to be removed for servicing.
13. Flexible conduit runs shall consist of liquid tight conduit only. Flexible conduit runs shall be joined with specified connectors and the connectors shall be made up tightly onto the lengths of flex and onto its connected devices. All plastic jacketed flexible conduit connections shall be watertight.
14. Cap each end of conduits as soon as placed to prevent mud, dirt,

debris, and water from entering raceways. Each run shall be swabbed clean prior to wire pulling.

15. All junction and pull boxes shall be equipped with blank covers.
16. All boxes shall be installed with their axes parallel to the lines of the building structure.
17. All conductors shall be the size as indicated and where no size is given, the conductor size shall be #12 AWG, unless otherwise specified.
18. Generally, control wiring shall be #14 AWG.
19. All wiring shall be installed in raceways unless otherwise indicated.
20. All power and control wiring shall be made with insulated, stranded copper wire.
21. No wire or cable shall be drawn into a conduit, until all work of a nature which may cause injury to the wire, is completed. A cable pulling compound shall be used as a lubricant and its composition shall not affect the conductor nor its insulation.
22. Do not exceed cable manufacturer's recommended pulling tensions.
23. Service and feeder wiring runs shall be made from terminus to terminus without splice except for yard runs which may be spliced in junction boxes or manholes.
24. Branch circuits shall run from supply to load without splice except where taps and splices are required for receptacle, light fixture, and small appliance loads.
25. Taps, splices, and connections in #8 AWG and larger shall be made with tinned copper alloy bolted pressure connectors. Make up connection tightly to produce as low a resistance as if the conductor were continuous. Such connectors shall be insulated with a smooth cover of void-filling insulation putty and then covered with at least four (4) half lapped layers of electrical tape. Insulated connector shall have at least 1-1/2 KV insulation value.
26. Except as otherwise specified; taps, splices, and connections with #10 AWG and smaller shall be made with insulated spring wire connectors. Such connectors in damp or wet locations shall be further insulated with an envelope of half-lapped EPR over the wire nut and down 1/2" over the incoming wires; prior to applying the envelope, use a stretched piece around each wire to fill the interstices between the wires; finished splices shall be waterproof.
27. Specified sizes of wire shall be installed with factory-pigmented

colors. Phase label black pigmented wires with colored banding tape as specified. Install labels at each terminus.

28. Numbered marking labels shall be installed to identify circuit numbers from panel boards and to identify control wires. Install labels on each wire in each panelboard, junction and pullbox, and device and control connection.
29. Label each wiring run with write-on waterproof labels inside each motor controller panelboard, pullbox, and handhole. Wrap label ties around wire group at conduit entrance and write on label the wire size, conduit size, and service.
30. Control wiring that terminates onto flat head type terminals shall be equipped with crimp-type spade lugs. Label each wire with number to correspond with terminal strip number.
31. All wiring inside enclosures shall be neatly trained and laced with tie-wraps.
32. All raceway systems, outlets, boxes, wireways, cabinets, enclosures, lighting fixtures, transformers, and related equipment shall be adequately and safely supported with at least 3-1 safety factor.
33. Slotted channels shall be used to support equipment that is mounted free of structure. Use factor fabricated back-to-back hot-dipped galvanized members with dimension of 1-5/8" X 3-1/4" deep that have hot-dipped galvanized factory fabricated welded feet.
34. Runs of exposed conduits shall be installed as follows:
 - a. Single surface runs shall be attached to the structure by means of conduit clamps, except as otherwise specified. Single runs along structural members shall be supported by means of side beam clamps, or similar supporting devices.
 - b. Multiple surface runs shall be attached to the structure by means of slotted channels. Each conduit shall be attached to the slotted channel by means of two-piece conduit clamps.
35. Slotted channels that are field cut shall have raw edges painted with cold galvanized coating spray paint.
36. All conduits (and tray cables) shall include an NEC-250 sized insulated equipment ground conductor.

B. Equipment

1. Panel boards, motor controllers, and electrical enclosures shall be installed as follows:
 - a. Follow manufacturer's installation instructions. Install

enclosures plumb and level. Bolt enclosures to concrete with 1/4" (minimum) diameter stainless steel bolts in Hilti type concrete anchors.

- b. Conduit entries into enclosures shall be carefully arranged and equipped with insulating bushing. The use of reducing washers shall not be allowed.
- c. All cables inside enclosures shall be neatly arranged and bundled and bound with plastic tie-wraps.
- d. Tighten all wire and busbar connectors to factory recommended torque settings using a torque wrench. Coat all wiring terminations with an ample amount of anti-corrosion compound, T & B Kopr-shield or equivalent.

3.02 DRAWINGS AND SUBMITTALS

- A. Submit shop drawings for the following:
 - 1. Wire (All Types & Voltages)
 - 2. Conduit-all types
 - 3. Safety Switches
 - 4. Pilot Devices
 - 5. Enclosures
 - 6. Terminal Blocks
 - 7. Panel boards
 - 8. Motor Controllers
- B. Submit catalog literature of each item of material specified.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION 16050

ELECTRICAL BASIC MATERIALS AND METHODS

**ELECTRICAL EXPERTISE, INC
P. O. BOX 12545
LONGVIEW, TX 75607
903-297-7811
FIRM REGISTRATION No. F-2490**

**SPECIFICATION SECTION 16051 FOR
MEDIUM VOLTAGE VARIABLE
FREQUENCY DRIVE**

PART 1 GENERAL

1.0 Scope

- 1.1 Definitions---The following definitions shall apply to this specification:
- a. The terms "Bidder", "Manufacturer", and "Supplier" are used inter-changeably within this document and shall refer to the responder to this specification.
 - b. The terms "Owner", "User", "Purchaser", and "Customer" are used inter-changeably within this document and shall refer to the City of Longview, Texas.
- 1.2 This Specification defines the requirements for Medium Voltage Variable Frequency Drives (VFD's) for the operation of 800 HP motors and related equipment at the existing Lake-O-Pines Raw Water Pump Station for the City of Longview, Texas.
- Each VFD shall be in a NEMA-1 rated enclosure not to exceed 136" W X 44" D X 100" H. Each VFD shall be warranted for two (2) years. Each VFD shall be further described below.
- 1.3 The Bidder shall prepare the bid to be in complete compliance with this specification. Any exception shall be included in the bid with an explanation, clearly indicating the paragraph of this specification to which the exception applies, and concisely stating the reasons.
- 1.4 Unless clearly identified as an exception, this specification shall have precedence where there is conflict between bidder's descriptive information and this specification.
- 1.5 This specification shall be for the furnishing, installation, and commissioning of the medium voltage VFD (s), as outlined herein. The installation of the VFD (s) shall be the responsibility of the contractor.
- 1.6 The contractor shall furnish all tools, equipment, material, supplies, and shall perform all labor required to install the medium voltage VFD (s).

2.0 Codes and Standards

- 2.1 Institute of Electrical and Electronic Engineers
- 2.2 IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Converters
- 2.3 IEEE 1100 – Powering and Grounding Sensitive Electronic Equipment
- 2.4 National Electrical Manufacturers Association (NEMA)
- 2.5 NEMA ICS 6 – Industrial Control and Systems Enclosures
- 2.6 NEMA ICS 7 – Industrial Control Systems Adjustable Speed Drives
- 2.7 National Fire Protection Association (NFPA)
- 2.8 NPFA 70 – National Electrical Code (NEC)

- 2.9 Underwriters Laboratory
- 2.10 UL 347 – Medium Voltage Power Conversion Equipment

3.0 Variable Frequency Drive Description

- 3.1 Each motor controller where indicated on the contract drawings shall consist of the following main components: one medium voltage variable frequency drive (VFD), fused isolation switch, isolation contactor, drive isolation/phase shifting transformers with minimum 24 pulse rectification, AC pre-charge circuit with isolating contactor, and output harmonic filter as necessary. All above items shall be integrated in one enclosure not to exceed 130" W x 44" D x 100" H.
- 3.2 Each integrated dedicated fused contactor with isolation switch shall be rated to protect the VFD from specified short-circuit levels with a minimum interrupting rating of 8500A @ 400A and 12,500A @ 800A. The VFD enclosure doors shall be interlocked to prevent opening when main power is available. DC bus capacitor charging shall be accomplished by use of an input reactor on the primary side of the input transformer to limit the current to the capacitors during charging. The pre-charge isolating contactor which shall be rated for VFD full load amperes shall short-circuit the reactor after charging has been completed.
- 3.3 Each VFD shall meet the requirements of IEEE 519. The point of common coupling shall be considered to be located at the secondary terminals of the utility transformer. The harmonic current distortion shall not exceed the limits listed in table 10.3 of IEEE 519. The harmonic voltage distortion shall not exceed the limits listed in table 11.1 of IEEE 519.
- 3.4 Each VFD input shall accept 2,300, 3,300, or 4,160V, 3 phase, 50/60 Hz power and shall be able to operate with a +/-10 % voltage variation.
- 3.5 All required auxiliary power (480V, 3 phase, 60 Hz, etc.) required by the VFD shall be provided from an external supply voltage source as indicated on the contract drawings.
- 3.6 Each VFD shall be suitable for the operation of a motor rated 4,160V, 3 phase, 60 Hz, 800 HP. The existing motors are as follows:

Westinghouse TECO, Type AMRK-EC002, Frame 450M, WP1
4,160 Volt, 3-phase, 60 HZ, Design B, 106 Amp, 1182 RPM,
Insulation Class F, 40 Degree C Ambient, 1.15 S. F, NEC Code F
- 3.7 For variable torque applications, the overload capacity of each VFD shall be 110% of rated current for 1 minute and shall be repeatable every 10 minutes. For constant torque applications, the overload capacity shall be 150% of rated current for 1 minute and repeatable every 10 minutes.
- 3.8 Each VFD shall be suitable for use with a new or an existing standard squirrel cage motor with a 1.0 service factor and standard medium-voltage insulation.
- 3.9 Each VFD shall be suitable for use in an environment of 3,300-ft altitude above sea level and less than non-condensing 95% relative humidity.
- 3.10 Quality Assurance:
 - a. All equipment furnished under this section shall be warranted by the equipment manufacturer for a minimum period of two (2) years (except as specifically noted otherwise) after completion of installation and start-up has been accepted as complete.

- b. The VFD manufacturer shall have ISO 9001 certification.
- c. The manufacturer shall have a factory trained field engineering staff located in the Dallas-Fort Worth Metro-plex area to provide start-up service, 24-hour/day emergency call service, repair work, maintenance, and troubleshooting training of customer personnel.

3.11 The VFD shall meet the following standards:

- a. ANSI and NEMA Standards
- b. Underwriter's Laboratories (UL)
- c. CSA
- d. IEC

4.0 Submittals

4.01 The contractor shall provide final approval drawings for review by the engineer prior to release of the VFD equipment for manufacturing. The drawings shall be provided for all the equipment included in this specification. The submittals shall be provided within six (6) weeks of issuance of the notice to proceed to the contractor. The manufacturer shall provide six (6) copies of:

- a. Dimensional outline and plan arrangement drawings including clearance requirements, foundation details, and weights.
- b. Electrical schematics, wiring, and interconnection drawings.
- c. Waste heat in BTU/Hr and required air flow in CFM.
- d. The bidder shall provide overall efficiency data at 25%, 50%, 75%, and 100% speed for all components. VFD's which have output voltage harmonic distortions greater than 3%, shall decrease the overall efficiency by 0.5% at each point to account for the additional losses, which will occur at the motor.
- e. The bidder shall provide total system power factor data at 25%, 50%, 75%, and 100% load.
- f. The bidder shall provide harmonic calculations to the 49th harmonic with the bid when requested. The calculations shall show total harmonic voltage and current distortion at the designated Point of Common Coupling (PCC).
- g. "As built" drawings shall be furnished. These drawings may also be furnished in electronic format.
- h. Part lists, bill of material.
- i. User manuals including storage, installation, operation and maintenance instructions for the equipment provided.

PART 2 DESIGN AND CONSTRUCTION

1.0 Acceptable Manufacturers

1.1 The VFD shall be manufactured by Eaton Electrical/Cutler-Hammer, or WEG.

2.0 Manufacturer and Equipment Qualifications

- 2.1 The VFD manufacturer shall have a minimum of 5 years of experience in the sales and marketing of this type of equipment.
- 2.2 Inverter design---Each VFD inverter shall be of the pulse width modulated (PWM) neutral point clamp (NPC) type. The inverter output devices shall consist of insulated gate bipolar transistors (IGBT's) with a voltage rating of 3,300V (for 2,400V outputs) and 6,500V (for 3,300V and 4,160V outputs). The use of lower voltage rated devices shall not be acceptable. Each inverter shall consist of one 3-phase unit capable of "roll-in/roll-out" design to minimize downtime in the event of inverter failure. The use of multiple 1-phase inverters shall not be acceptable.
- 2.3 Integrated Input Isolation Transformer and Rectifier---Each VFD shall include an incoming isolation transformer that shall accommodate a primary voltage range of 2,300/3,300/4,160 volts. The transformer shall contain twelve 3-phase secondary windings that shall provide the proper phase shifting to develop a 24-pulse rectification to reduce harmonic currents and voltages that may be reflected back to the primary power system. The transformer shall be copper wound and shall have a 220°C insulation system which shall allow it to operate at 115° C rise (above an ambient of 40° C) at full load conditions. The transformer and rectifier shall be an integral part of the VFD assembly. The assembly shall also include a primary disconnect switch, input vacuum contactor, and secondary fusing which shall eliminate the need for separate components, field installation, or wiring.
- 2.4 Reliability---The equipment shall be designed for trouble free operation and reliability. Compliance with the following shall be required:
- a. The manufacturer shall list all control and power components that require recommended maintenance or replacement before 50,000 hours of operation. This information shall be available in the manufacturer's maintenance manual and available for submittal.
 - b. The mean time between failures (MTBF) of the VFD shall be greater than 40,000 hours. All components of the VFD shall be considered for MTBF calculations.
 - c. The VFD shall be capable of continuous operation ("ride-through") in the event of a power loss of up to 1 second.
 - d. The VFD shall be able to safely operate, without tripping, with up to 30% voltage sag on the rated input voltage.
 - e. The inverter shall use IGBT type switches, which shall be rated for at least 130% of the full motor voltage.
 - f. The buyer intends to purchase a medium-voltage VFD system. All power semiconductors and passive power components in both the rectifier and inverter sections shall consist of medium voltage rated components. Low voltage components are not acceptable in the power sections.
- 2.05 Input Power Quality---Each VFD shall adhere to the following criteria:
- a. Each VFD shall comply with the latest edition of IEEE 519 for total harmonic and current distortion limits and calculations with a minimum of 24-pulse rectification. Anything less than 24 pulse will not be acceptable. The transformer shall contain 12 three phase secondary windings that provide the proper phase shifting to develop a 24-pulse rectification to reduce harmonic currents and voltages reflected to the primary power system. Each VFD total harmonic voltage distortion (THD) contribution at each point of common coupling between the drives and other loads within the facility (Load

PCC) shall not exceed the 5% THD limit recommended for General Systems as listed in Table 11.1 of IEEE 519, throughout the VFD's speed range.

- b. The fundamental power factor of each VFD shall be greater than 97%. The total power factor at each VFD input shall be greater than 95% for a load range of 20 to 100%. The VFD manufacturer shall provide a power factor correction filter if the VFD does not meet this requirement. The VFD including power factor correction and/or harmonic filtering shall never have a leading power factor.

2.06 Output Power Quality---Each VFD shall adhere to the following criteria:

- a. The effects of output waveform switching transients and harmonic content shall have a negligible contribution to motor heating, acoustical noise in the motor, torsional stress in the power train, and motor insulation.
- b. Common mode voltages on the VFD output shall be isolated from the motor. Motor cable voltage reflections and the resulting restrictions on motor cable length shall be eliminated. The VFD output shall produce sinusoidal voltage output waveform with less than 3% voltage total harmonic distortion (THD) throughout the speed range of 30 – 100%. Actual voltage THD values shall be required to be listed with the bid to verify compliance. The audible motor noise shall not increase while powered by the VFD.

2.07 Control Functions---Each VFD shall adhere to the following criteria:

- a. Each VFD shall be equipped with a door-mounted graphical keypad (HMI) with LCD display. Keypad shall be removable type with remote mounting capability with NEMA 4 protection. HMI shall be capable of displaying 1–6 parameters simultaneously. The HMI shall also be capable of on-line graphic visualization (watch function). An on-line help function shall be included in the HMI allowing for trouble shooting and diagnostics. The HMI contrast shall be adjustable for various ambient light conditions. Access to parameters shall be password protected. If specified, the VFD shall be supplied with a touch screen display.
- b. Standard advanced programming and trouble-shooting functions shall be available by using a personal computer (PC). The PC shall be connected through an RS-232 (or USB) port and shall use Windows™ based software. In addition the software shall permit control and monitoring via a RS232 (or USB) port on the front of the VFD. The manufacturer shall supply a diskette with the required software. A PC shall not be required. An easily understood instruction manual and software help screens shall also be provided. The computer software shall be used for modifying the drive setup and reviewing diagnostic and trend information as outlined in this section below.
- c. The operator shall be able to scroll through the keypad menu to choose between the following:
 - 1) Monitor
 - 2) Operate
 - 3) Parameter setup
 - 4) Actual parameter values
 - 5) Active faults
 - 6) Fault history
 - 7) LCD contrast adjustment
 - 8) Information to indicate the standard software and optional features software loaded.

d. The following setups and adjustments, at a minimum, are to be available:

- 1) Start command from keypad, remote or communications port
- 2) Speed command from keypad, remote or communications port
- 3) Motor direction selection
- 4) Maximum and minimum speed limits
- 5) Acceleration and deceleration times, two settable ranges
- 6) Critical (skip) frequency avoidance
- 7) Torque limit
- 8) Multiple attempt restart function
- 9) Multiple preset speeds adjustment
- 10) Catch a spinning motor start or normal start selection
- 11) Programmable analog output
- 12) DC brake current magnitude and time
- 13) PID process controller

2.08 The VFD shall have the following system interfaces:

- a. Inputs – A minimum of six (6) programmable digital inputs, two (2) analog inputs, and serial communications interface shall be provided with the following available as a minimum:
- 1) Remote manual/auto
 - 2) Remote start/stop
 - 3) Remote forward/reverse
 - 4) Remote preset speeds
 - 5) Remote external trip
 - 6) Remote fault reset
 - 7) Process control speed reference interface, 4-20mA_{dc}
 - 8) Potentiometer and 1-10V_{dc} speed reference interface
 - 9) RS232 programming and operation interface port
 - 10) Serial communications port
- b. Outputs – A minimum of two (2) discrete programmable digital outputs, one (1) programmable open collector output, and one (1) programmable analog output shall be provided.
- c. Programmable relay outputs with one (1) set of Form C contacts for each, selectable with the following available at minimum:
- 1) Fault
 - 2) Run
 - 3) Ready
 - 4) Reversed
 - 5) Jogging
 - 6) At speed
 - 7) Torque Limit Supervision
 - 8) Motor rotation direction opposite of commanded\
 - 9) Over-temperature
- d. Programmable open collector output with available 24V_{dc} power supply and selectable with the following available at minimum:
- 1) Fault
 - 2) Run
 - 3) Ready

- 4) Reversed
- 5) Jogging
- 6) At speed
- 7) Torque Limit Supervision
- 8) Motor rotation direction opposite of commanded
- 9) Over temperature

e. Programmable analog output signal, selectable with the following available at minimum:

- 1) Motor current
- 2) Output frequency
- 3) Frequency reference
- 4) Motor speed
- 5) Motor torque
- 6) Motor power
- 7) Motor voltage
- 8) DC-bus voltage
- 9) Analog Input 1
- 10) Analog Input 2
- 11) Temperature
- 12) Feedback digital input

2.09 Monitoring and Displays

a. Each VFD display shall be a Liquid Crystal type capable of displaying three (3) lines of text and the following thirteen (13) status indicators:

- 1) Run
- 2) Forward
- 3) Reverse
- 4) Stop
- 5) Ready
- 6) Alarm
- 7) Fault
- 8) I/O terminal
- 9) Keypad
- 10) Bus/Comm
- 11) Local (LED)
- 12) Remote (LED)
- 13) Fault (LED)

2.10 Each VFD keypad shall be capable of displaying the following monitoring functions at a minimum:

- a. Output frequency
- b. Frequency reference
- c. Motor speed
- d. Motor current
- e. Motor torque
- f. Motor power

- g. Motor voltage
- h. DC-bus voltage
- i. Unit temperature
- j. Calculated motor temperature
- k. Voltage level of analog input
- l. Current level of analog input
- m. Digital inputs status
- n. Digital and relay outputs status
- o. Analog out

2.11 Protective Functions---The VFD shall include the following protective features at minimum:

- a. Over current
- b. Over voltage
- c. Inverter fault
- d. Under voltage
- e. Input phase loss
- f. Output phase loss
- g. Under temperature
- h. Over temperature
- i. Motor stalled
- j. Motor over temperature
- k. Motor under load
- l. Logic voltage failure
- m. Microprocessor failure

2.12 Each VFD shall provide ground fault protection during power-up, starting, and running. VFD's with no ground fault protection during running shall not be acceptable.

2.13 Diagnostic Features---Each VFD shall include the following diagnostic features at minimum:

- a. Fault History
- b. Record and log faults

- c. Indicate the most recent first, and store up to 30 faults
 - d. An Emergency-stop (E-Stop) shall be provided on the VFD door in addition to inputs for customer supplied E-Stop command(s)
- 2.14 VFD Construction---Each VFD shall comply with the following:
- a. Indoor enclosures shall be NEMA 1.
 - b. The VFD Converter shall require front access only.
 - c. The VFD Converter enclosure doors shall include an electro-mechanical interlocking system with a safety-grounding switch. The enclosure doors can be opened only if the safety ground switch connects the plus, minus and neutral DC buses to ground to ensure all stored VFD and motor energy is discharged. Enclosures shall be configurable separately or in a continuous line-up. VFD's shall be capable of being integrated with conventional motor starters, load break switches, circuit breakers, and reduced voltage starters into a seamless continuous control-gear assembly.
 - d. The drive isolation transformer, fused input contactor, isolation switch, AC pre-charge circuit contactor, output filter, if required, and input harmonic filter and power factor correction filter, if required, shall be factory mounted wired by the manufacturer and integrated into the VFD enclosure.
 - e. All painted surfaces shall have an exterior finish of the manufacturer's standard color.
 - f. The enclosure must be designed to avoid harmonic and inductive heating and eliminate radio frequency interference.
- 2.15 Control Power Transformer (CPT)---A control power transformer (CPT) shall be provided within each enclosure. The CPT primary shall take power from the drive primary power. The kilovolt-ampere rating of the CPT shall be determined by the manufacturer and shall have a minimum of 25% spare capacity. The CPT secondary voltage shall be 120/240 VAC. The CPT primary shall be fused with current limiting fuses with an interrupting rating no less than 100,000 amperes. The CPT secondary shall be fused and have one terminal grounded.
- 2.16 VFD Enclosure---The VFD enclosure shall be suitable for installation in an indoor, unclassified area. All enclosure openings exceeding 0.25 inch (6 mm) in width shall be provided with screens to prevent the entrance of snakes, rodents, etc. The maximum screen mesh opening width shall be 0.25 inch (6 mm). Air filters shall be of a reusable type that can be easily cleaned. All doors or front panels shall be fully gasketed.

Air exhaust from cooling fans shall be at the top of the enclosure and shall direct exhaust air flow away from personnel in front of the equipment. The forced air cooling equipment (fans) shall be adequately sized to remove the waste heat generated by the VFD when running at full load. The VFD shall be able to operate in an ambient temperature of 104 degrees F. A "loss of cooling" fault shutdown shall be furnished with the forced-cooling equipment. In the event of clogged filters or fan failure, the drive shall shut down safely without electronic component failure. Fan motors shall be protected by an input circuit breaker. Plastic muffin fans shall not be acceptable. Fan power shall be obtained from an auxiliary power source as shown on the contract drawings.

VFD noise level shall be no greater than 75 dB (A) at 3 feet distance from the front of the VFD and 4 ft above the floor in front of the VFD. VFD's with a noise level higher than 75db shall not be acceptable.

- 2.17 Integrated Input Isolation Switchgear---Each VFD shall include an isolation disconnect with dedicated fused vacuum type contactor to feed the isolation/phase shifting transformer and AC pre-charge DC bus circuit with ratings as described above. The integrated control-gear shall be suitably rated for 115% of the load current in accordance with NEC 430-2.
- 2.18 Integrated Drive Isolation Transformer---A drive isolation transformer shall be integrated in the VFD enclosure to provide power conversion from the line voltage to the required VFD voltage and to isolate the line from harmonics and common mode voltages. Each transformer shall conform to ANSI/IEEE C57 or to corresponding IEC standards. Each transformer shall be designed to withstand a short circuit. It shall maintain electromagnetic symmetry when only one secondary winding is in short circuit in order to minimize the resulting short circuit forces. The transformer shall be capable of thermally withstanding a short circuit for 2 seconds. Transformers shall be of a high efficiency type with full load losses of less than 2%. Transformer winding material shall be copper. Suitable vibration dampers shall be provided with the transformer and its enclosure in order to attenuate mechanical resonance and to reduce the operational sound level. The transformer shall include electrostatic shielding between the windings to carry high frequency capacitive currents to ground. Transformer designs shall be open type mounted. The transformer shall be of the air-cooled type and be forced ventilated. Only rectifier grade K-factor transformers shall be utilized, with a K-Factor of 6 for diode rectifiers. VFD manufacturers providing SCR type rectifiers shall provide transformers with K Factor rating of 12 for variable torque applications and K Factor rating of 20 for constant torque applications.
- 2.19 Harmonic Filters and Power Factor Correction---If required to meet the specification herein, the VFD manufacturer shall provide a harmonic filter and power factor correction equipment on the input and output of the VFD. Power factor correction equipment shall be provided as necessary to maintain a constant input power factor of 0.95 lagging throughout the entire load range. Required filters shall be contained and mounted in the VFD enclosure. Free standing filters shall not be acceptable. Capacitors shall be environmentally safe. Discharge resistors and a method of shorting the phases shall be provided. Inductors may be air or iron core. Inductors shall have Class F insulation with Class B temperature rise. Annunciation of input and output filter failures shall be provided.
- 2.20 Efficiency---Overall efficiency of the VFD shall include the drive isolation transformer, VFD and all VFD auxiliaries, output filter, power factor correction equipment, and harmonic filter. VFD system efficiency calculations shall be in accordance with IEEE 995. The overall efficiency shall be not less than 96% at full load and full speed.
- 2.21 Resistance Temperature Detector (RTD) Monitor---Each VFD shall include a monitor to accommodate the inputs from eight 100 ohm platinum RTD's located in each pump motor. The monitor shall display the temperatures in °F/°C and shall provide for operator setting of alarm and trip temperature setpoints. Multiple alarm and trip outputs shall be available for remote indication and shutdown. The trip setpoint shall be wired to shutdown the VFD.

PART 3 EXECUTION

1.0 Testing

- 1.1 Each VFD shall undergo standard manufacturing testing. Each VFD shall be factory load tested with an induction motor on a dynamometer or reactor test stand for a minimum of four (4) hours at rated current. Individual IGBT cells shall undergo a visual inspection, an electrical inspection, and a complete full load test prior to final assembly into the VFD.

2.0 Commissioning

- 2.1 The VFD manufacturer shall provide the services of a factory engineer for the start-up of the equipment after it is installed according to the manufacturer's recommendations. Functional testing, commissioning, and first parameter adjusting shall be carried out by the factory engineer. Testing, final parameter adjustments, and performance tests shall be carried out by the factory engineer with the customer present.

Two (2) consecutive eight-hour man-day of commissioning shall be included in the bid for each VFD installed. A rate schedule for commissioning, travel to the jobsite, and living expenses for additional work shall be included with the bid proposal. After commissioning has been completed, the factory engineer shall review the customers operating procedures and provide one additional 8 hour day of basic hands-on maintenance and operation training to the customer's personnel. The operator training shall be scheduled in writing, at the customer's convenience, after start-up and check-out has been completed.

Microsoft Windows based software shall be provided for VFD commissioning, parameters setup, fault log viewing, diagnostic analysis, monitoring, and control. The software shall provide real time graphical displays of VFD performance.

- 2.2 Spare Parts---The VFD manufacturer shall provide a complete list of spare parts for the VFD. The VFD manufacturer shall provide local support for renewal parts and stock spares within the Continental USA. As a minimum, the VFD manufacturer shall include these spare parts as part of the bid:

- a. 100% spares of each type of medium voltage fuse.
- b. 100% spares of each type of low voltage fuse.
- c. Special tools for testing or maintaining equipment.

- 2.3 Preparation For Shipment---Equipment shall be individually crated and tagged with proper identification of the assembly to which it belongs. Materials, including detailed wiring diagrams and instructions for reassembling shipping sections and making bus connections at shipping splits, shall be provided. Terminal strips shall be provided for all interconnecting wiring at shipping splits. Each wire terminal shall be identified with permanent wire markers. Each shipping section shall be furnished with lifting angles, eyes, or plates suitable for lifting hooks or slings.